AMERICAN GAS JOURNAL

90th YEAR | AUGUST, 1948 | VOL. 169, NO. 2

The New

ROBERTSHAW

UNITROL

GRAYSON

Space Heater Thermostat

A packaged unit combining thermostat, safety pilot, A, B and C controls in one assembly.

Installed with sensitive bulb in cold air return of floor furnace or space heater.

Provides accurate automatic control of room temperature without outside electrical connections.

100% shut off of both pilot and main burner gas by snap-acting thermostatic control.

Safe lighting—during pilot lighting operation gas cannot flow to main burner.

Thermo-magnetic type automatic pilot has moving parts in combustion chamber.

Flexible capillary tubing makes installation simple and permits location of thermostat in most effective position.

Model shown is A-14 with ⅜" x 14" bulb.

Model A-15 with 3/16" x 65" bulb also available.

THE ... SERIAL ... AUG 30 ... RECEIVED

In home and industry, **EVERYTHING'S UNDER CONTROL** **Robertshaw-Fulton**

CONTROLS COMPANY — YOUNGWOOD, PENNSYLVANIA

FULTON SYLPHON DIVISION, Knoxville, Tennessee
BRIDGEPORT THERMOSTAT DIVISION, Bridgeport, Connecticut
GRAYSON CONTROLS DIVISION, Lynwood, California
AMERICAN THERMOMETER DIVISION, St. Louis, Missouri

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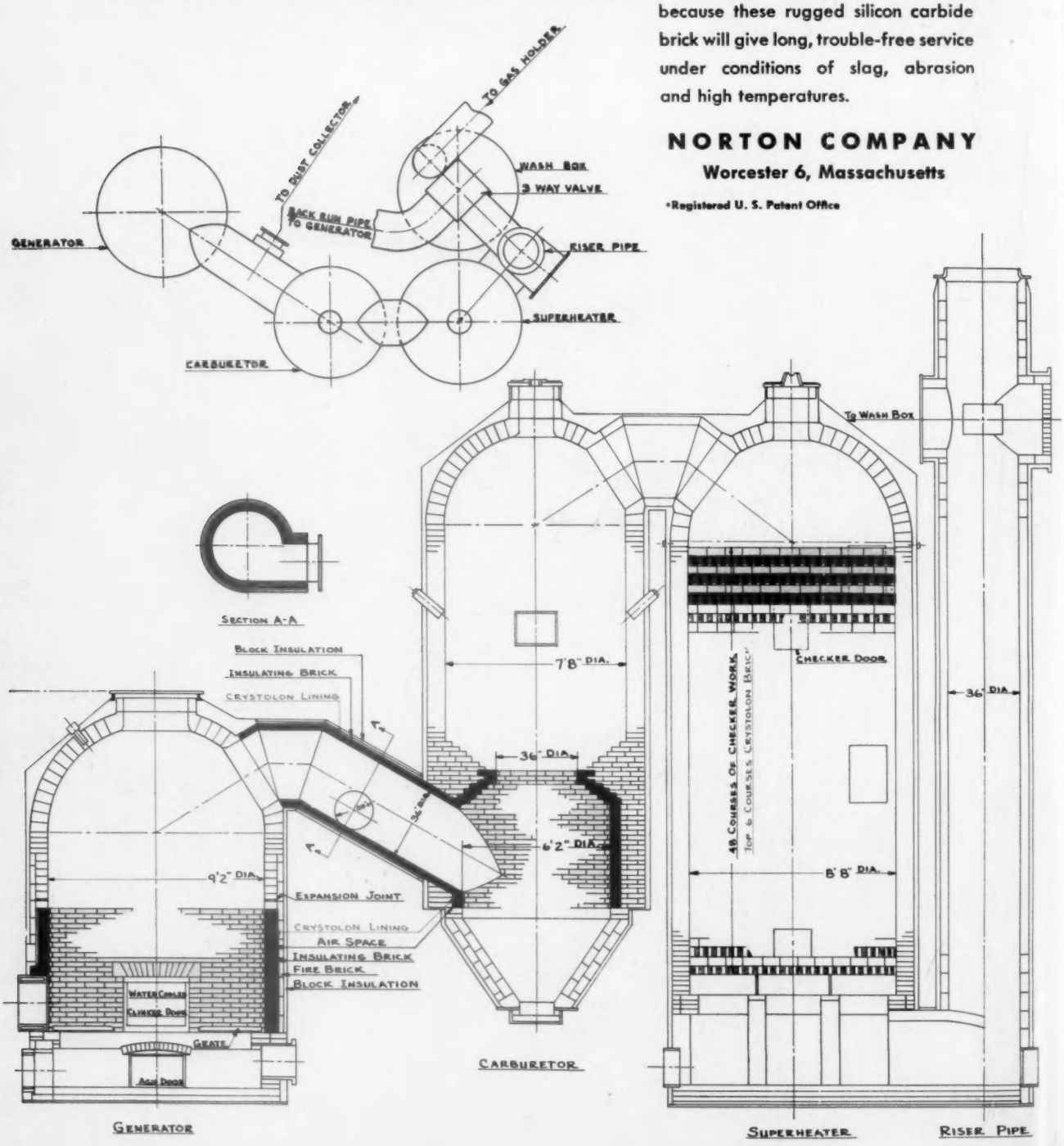
In Generator, Carburetor and Superheater It Pays to Install CRYSTOLON* Brick

The drawing below shows the installation of CRYSTOLON Brick in a reverse flow, open carburetor type of water gas set. Twenty-four courses of CRYSTOLON Brick were laid in the generator, extending up five feet from the grate line. A full lining of CRYSTOLON Brick was set in the generator offtake, and 28 courses of these brick were laid in the base of the carburetor. In some recent installations six courses of CRYSTOLON Brick have also been added to the checkerwork in the top of the superheater. CRYSTOLON Brick are selected because these rugged silicon carbide brick will give long, trouble-free service under conditions of slag, abrasion and high temperatures.

NORTON COMPANY
Worcester 6, Massachusetts

*Registered U. S. Patent Office



NOW 66

15 more since we first published this advertisement in October, 1946

~~51~~

100,000 to 10,000,000 CU. FT.

ALL-WELDED GAS HOLDERS

Largest all-welded, wet seal gas holder in the United States—5,000,000 cu. ft. capacity. Installed by Stacey Brothers Gas Construction Company at Long Beach, California.

Who built the largest all-welded, panel type gas holder in your vicinity?

Chances are, the answer is *Stacey Brothers Gas Construction Company.*

We say "chances are", because we've built *more than ~~60~~ 77,000,000 cubic feet of holder capacity.* The largest of these installations—100,000 to 10,000,000 cubic feet—are shown on the map. Note, particularly, how many of them have been repeat orders. In addition to these big ones, we've designed and constructed many, many smaller ones—even down to 100 cubic feet.

You have only to make a personal inspection trip to any one of these installations and you'll know why Stacey Brothers has been the choice of so many operators. You'll see a holder that's not only good to look at—it's even better to operate! A mechanically round structure, free of unsightly deformations, is one clue to trouble-free, dependable, *economical* operation.

Since we first introduced the famous patented all-welded, panel type construction in this country we've had more experience in building all-welded holders than any other company. You can capitalize on that experience.

May we arrange an inspection trip for you?

STACEY BROTHERS GAS CONSTRUCTION CO.
One of the Dresser Industries
5535 VINE STREET • CINCINNATI 16, OHIO

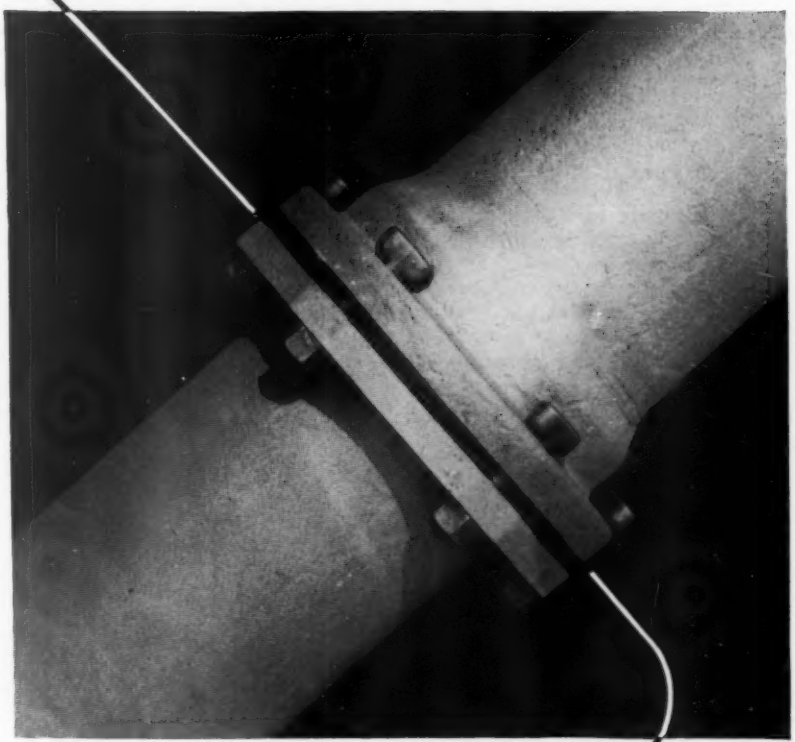
Now installing 10,000,000 cu. ft. holder at Elizabeth N. J.

Largest all-welded, dry seal gas holder in the United States—10,000,000 cu. ft. capacity. Installed by Stacey Brothers Gas Construction Co., at Dearborn, Michigan.

Stacey Brothers
ALL WELDED GAS HOLDERS

24" standardized mechanical joint cast iron pipe strung along line of trench site for feeder main for a midwestern gas utility

In making or planning additions to mains to meet a greatly increased demand for gas service, many utilities are *standardizing* on *standardized* mechanical joint cast iron pipe. They are adopting this policy regardless of pressures or types of gas. Mechanical joint cast iron mains are *known* to be long-lived and *known* to be bottle-tight. Further considerations are, (1) *speed and simplicity of installation:* more footage can be laid per day with minimum equipment and a small crew of unskilled workers; and, (2) *standardization:* accessories and fittings are interchangeable with those furnished by all makers of mechanical joint cast iron pipe. Address inquiries to Cast Iron Pipe Research Association, Thomas F. Wolfe, Engineer, Peoples Gas Building, Chicago 3, Ill.



STANDARDIZE ON

CAST IRON

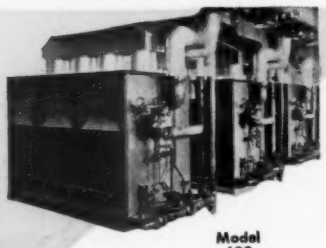
Standardized **MECHANICAL JOINT**

PIPE

FOR WIDEST selection

RADIATION HEATING

Choose the boiler for your domestic, commercial or industrial radiation heating job from the *thirty-six* basic sizes in the Bryant line. Rated from 67,500 to 3,966,000 Btu per hour, Bryant Boilers are available in hot water, vapor and steam types . . . a size and type for any radiation heating application.



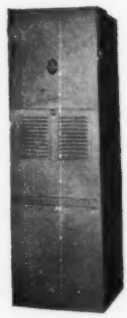
Model 630

Model 443

WINTER AIR CONDITIONING

These Bryant Winter Air Conditioning Units provide the design and operation features that you want for single or multiple installations. Made in conventional basement model with cast iron heat exchanger, and vertical types with either cast iron or *Hevigage* steel heat exchangers. 17 different sizes; inputs 45,000 to 250,000 Btu per hour.

Model BA-88



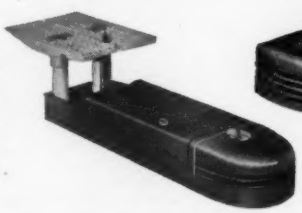
Model VB

Model VS-304

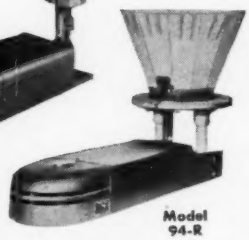
CONVERSION BURNERS

Old-fashioned furnaces become modern, fully-automatic gas heating plants with Bryant Conversion Burners. Bryant provides three types in two basic models: round burner and baffles for conventional round furnaces, rectangular burner for rectangular boilers and furnaces, and a single-port, spread-flame budget model for special applications. Ten sizes.

Model 94-S



Model 97

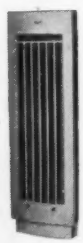


Model 94-R

SPACE HEATERS

Heat a single room . . . cabin, office, study, laundry . . . or a complete home with these Bryant Space Heaters. They provide welcome warmth by both radiation and circulation, require less floor space than the ordinary radiator, eliminate the hazards of old-style, open-flame heaters. Seven different sizes, inputs 15,000 to 60,000 Btu per hour, manual or automatic control.

Model VC-426



Model WV-401

All Bryant products are approved by American Gas Association for use with natural, manufactured, liquefied petroleum or mixed gases.

FLOOR FURNACES

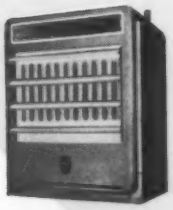
Bryant Floor Furnaces are engineered for ease of installation and operation. They are designed to fit between standard floor joists, provide floor level access to ignition and temperature control. They feature Bryant electric *Dial-Lite* ignition, are made in three sizes for automatic or manual control with inputs from 25,000 to 45,000 Btu per hour.

Model FF-361

IT'S BRYANT... ALL ALONG THE LINE!

Model 26

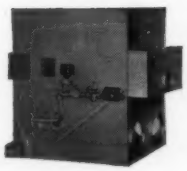
Model 85



Model US-322

UNIT HEATERS

Bryant Unit Heaters complement the smart interiors of modern stores and offices, adapt themselves readily to factories and warehouses and in other commercial or industrial establishments. Model 85, in five sizes from 65,000 to 255,000 Btu per hour, has tubular steel heating sections; Model US-322, six sizes with inputs from 60,000 to 210,000 Btu per hour, features the *Hevigage* steel heat exchanger.

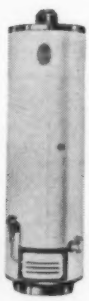


Model SGF-362

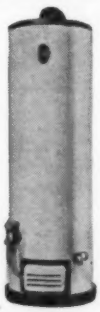
Model GS-57

WARM-AIR HEATING

These Bryant Gravity Warm-air Furnaces are built for budget homes. They include a standard basement model for replacement of old, worn-out furnaces in existing housing or for new, low-cost housing; plus the splendid new Bryant Suspended Gravity Furnace with smooth-running propeller-type fan for use as a central core in small homes. Model GS-57 is made in four sizes, inputs from 70,000 to 140,000 Btu; Model SGF-362 in 55,000 and 70,000 Btu inputs.



Model 103 *Red Seal*



Model 110 *Black Seal*

Model 115 *Blue Seal*

WATER HEATERS

Here's the automatic storage water heater line that is taking the country by storm . . . the Bryant *Red Seal,* a standard economy model; the Bryant *Black Seal,* a superior water heater with five exclusive features; and the *Blue Seal,* with the Bryant *Protect-O-Rod*—the water heater that is ***built to grow old,*** backed by a 10-year protection plan. Bryant Water Heaters offer special burners for each type of gas, are made in 20, 30, 40, 50-gallon sizes.

The most complete line of gas heating equipment in the nation...*at your service!*

Unit for unit, the complete Bryant line of automatic gas heating equipment covers every phase of radiation, convection and conduction heating. It is backed by powerful national advertising, by a great array of tested sales aids; supported by extensive sales and service training activity and a nation-wide distribution and parts service organization set up for easy access by dealer and customer. And it's yours to tie onto . . . for bigger sales, more trouble-free installations and a host of satisfied customers. Let the Bryant distributor in your territory tell you how . . . *now!*

Let the pup be furnace man ... and water boy, too!

bryant

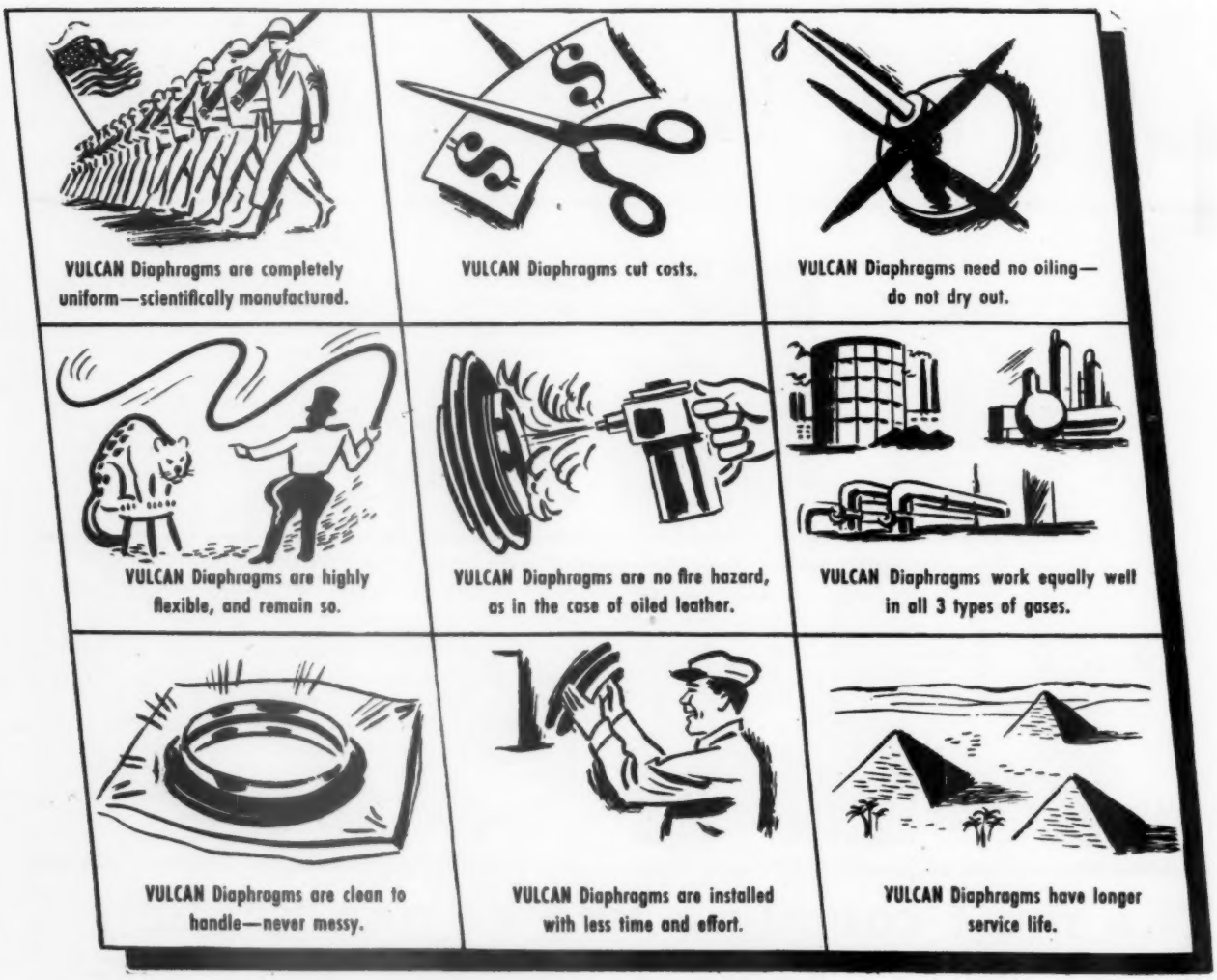
AUTOMATIC HEATING

BRYANT HEATER COMPANY

Cleveland, Ohio

One of the Dresser Industries

9 reasons why engineers everywhere now specify VULCAN DIAPHRAGMS



VULCAN Diaphragms are completely uniform—scientifically manufactured.

VULCAN Diaphragms cut costs.

VULCAN Diaphragms need no oiling—do not dry out.

VULCAN Diaphragms are highly flexible, and remain so.

VULCAN Diaphragms are no fire hazard, as in the case of oiled leather.

VULCAN Diaphragms work equally well in all 3 types of gases.

VULCAN Diaphragms are clean to handle—never messy.

VULCAN Diaphragms are installed with less time and effort.

VULCAN Diaphragms have longer service life.

For more accurate metering, greater economy and all-round advancements, insist on VULCAN Diaphragms in your meters.

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CONTENTS

Economic Factors for Distribution Design—George A. S. Cooper 11

Pressure Control and Other Problems of Long Line Gas Dispatching—A. L. Bristow 15

Gas Crews Restore Service to Vancouver, Wash. 18

Canadian Gas Association Annual Meeting 19

Large Volume Water Heating—Chapter 8. Part 5.—Malcolm B. Mackay 22

Technical Aspects of the Washington Changeover—Frank P. Lamb 27

Franchise vs. Public Service Commission—Leo T. Parker ... 31

Along the Pipe Lines 34

New Equipment & Appliances 35

News of the Gas Industry 37

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Burner is produced

BUILD GREATER

Customer Satisfaction on

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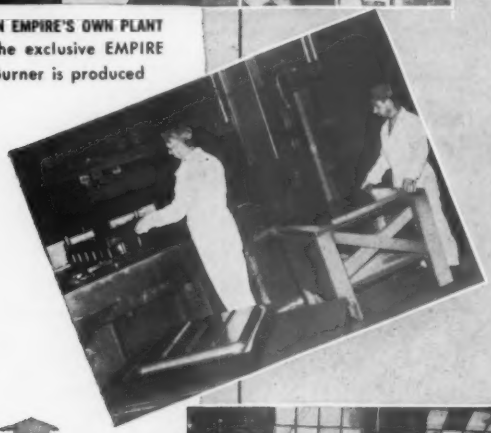

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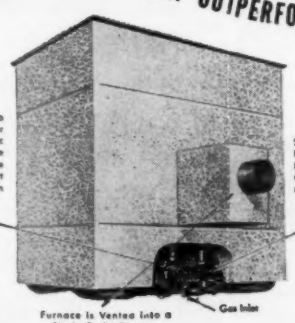
Unified production means that 95% of all integral parts are produced in the EMPIRE plant... an achievement not found elsewhere in the Industry... and that a definite control over materials, methods, and fabrication assures uniformity of quality.

DEPEND ON EMPIRE—THE GAS FLOOR FURNACE THAT OUTPERFORMS ALL OTHERS


It Is Now a Simple Task to Convert an EMPIRE Floor Furnace to Thermostatic Operation. Simply Remove Union Connections and Pipe Installed in Furnace, Insert Solenoid Valve Between Unions and Replace.
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EMPIRE STOVE CO.

BELLEVILLE, ILLINOIS

MANUFACTURERS OF GAS HEATING AND COOKING APPLIANCES

AUGUST 1948

AMERICAN GAS JOURNAL

VOLUME 169 NO. 2

Economic Factors for Distribution Design

By

George A. S. Cooper

Mechanical Engineer, Public Service Electric and Gas Company, Newark, New Jersey

In presenting this subject at the Distribution Conference of the A.G.A. in Pittsburgh, Mr. Cooper offers a plan for an engineering survey, incorporating all the factors that must be considered in the transport of gas from works to customer.

The tables, presented in logical sequence, give cost summaries of equipment and operations involved, concluding with cost index for mains from 4 inch to 24 inch diameter. Managers and distribution engineers should derive considerable benefit from a careful study of this comprehensive analysis—Ed.

IT HAS BEEN standard practice among gas manufacturers to express their detailed operating costs in Cents/M sold, Cents/M made, or similar methods. This same system can be applied in setting up an engineering survey for economical pumping systems so that the proper relation of the cost of the compressors, installation, the cost of the boiler plant other power unit, its operation, maintenance, fuel costs for power, costs of the main and other items connected with the movement of gas from the works to the customers' service can be set up using a relative Dollars/M maximum hour to provide a condensed study for selecting the most economical condition and also showing the additional costs of other quantities, costs and pressures.

Before proceeding further it would seem advisable to define some of the phases used which will later be described in more detail as they appear in the study.

(1) *Load factor.* Ratio of average hour to maximum hour.

(2) *Power factor.* Ratio of average power per hour to maximum power per hour.

(3) *Power adjustment factor.* Ratio of power factor to load factor.

(4) *Compressor house installation.* The complete installation of compressor, foundations, piping and building.

(5) *Boiler plant.* The usual boiler plant installation, all boilers, steam headers, coal handling machinery and relative items.

(6) *Station installation.* Compressor house and boiler plant combined.

(7) *Annual charges.* Charges representing a percentage of investment costs (annual return on investment) plus amortization charges and plus taxes on capital investment.

(8) *Annual operating costs.* Cost of fuel, maintenance, labor, etc.

(9) *Capacity of mains.* The usual capacity of mains computed by flow formulas with an additional percentage for takeoff. Although the Spitzglass formula was used where an example is here shown to demonstrate a method, other formulas may be substituted for local surveys at the discretion of the designing engineer.

(10) *Cost indices.* The total cost, expressed in dollars per M maximum hour, summarizing the annual charges of compressor house, boiler plant, fuel and mains.

This entire study is submitted as a method to be used by local designing engineers in analyzing local problems and using local costs. The example used for illustration is a portion of a study made by the writer in a similar local study.

The engineering details of making the proper selection of compressor stations and mains in a distribution system, to provide a flexible and adequate system of supplying gas to various types of customers, at an average minimum total cost, is a very complex problem because of the various factors of capital costs, operating expenses, load factors, predicted changes in load factors, and planning for new changing types of customers in the future.

Load factor is most important for knowledge of any system. It is the ratio of the average to the maximum and is usually expressed in percentage. To obtain a clear picture of load factor in a distribution system, where the maximum hour is the predominant feature, a load factor of 40% would mean that the annual sales are 3,504 times the maximum hour (which is 40% of 8,760, the number of hours in a year).

Annual operating costs are strongly influenced by the load factor and power adjustment factor. These two factors are mentioned separately because equipment operating on the maximum hour is assumed to be operating at or near full efficiency. Where the station is always pumping at the maximum pressure the power factor is practically the same as the load factor. The power factor need not necessarily be the same percentage as the load factor, because the equipment is operating at lower efficiencies on off peak hours and usually at lower pressures at off peak hours,

thereby introducing a complex study. It is practically impossible to change the pumping pressures exactly consistent with the output in order to maintain minimum terminal pressures. Experience, usually from cost sheets or other data, will give a reasonable percentage to be used for a power adjustment factor to be applied to the load factor for the cost of fuel.

All fixed expenditures such as direct annual return, amortization and certain taxes on investment are readily converted to annual costs by applying a percentage for annual charges. The amortization charge is the only one of the three that would change in a study of a particular area since it represents the number of years life of the installation. For compressor stations, buildings and similar items the life is different than for underground piping.

The life of the mains is affected by local conditions and materials. In some localities the life of a main may be 100 years while in another locality the life may be only 10 years, hence the amortization charges must reflect the anticipated life of the mains as accurately as possible.

The annual charges shown in the tabulations are composed of a 6% annual return on investment, compound interest for 25 years amortization for compressor and boiler installations, compound interest for 50 years amortization for mains, and the balance direct taxes.

Station installations and mains are provided exclusively for the maximum hour demands and have no relation to load factor. To obtain a cost / Mcf delivered, the annual charges divided by the figure representing the maximum hours per year for the load factor used in the study, will give the Cents/M delivered. Thus if the annual charges for mains and station are $104/M max. hour (24" main 5 miles, 5 pounds) for a 40% load factor (3,504 hours per year) the result is 2.96 cents for mains and station per Mcf delivered.

Arrangement for Data

A design of the distribution systems of a company, operating in a territory which shows a normal form of growth, should be made in such a manner that planning for immediate conditions do not create embarrassment in later planning of studies for longer periods providing for additional future business. The study should be such that predictions can be made with reasonable accuracy, of the change in costs as the territory develops. By arranging estimates on a cost/M max. hour basis reflecting unit sections of compressors and power equipment, this data can be so arranged that the change in costs and equipment required, can be predicted as the territory grows. Rather than predict a certain number of compressors to be added each period of time, the cost of compressors/M max. hour can be expressed in a figure which will represent a station of the present size of one ten times its size.

By the same method when designing mains, data can be arranged so that the capacities of the mains under the various pressures and sizes can be readily tabulated to show their relation to each other and their costs. By then applying the annual charge percentages, the relative annual costs of the installations can also be tabulated for ready study and requirements. Operating costs are then to be added to the annual costs and a final tabulation can be made—so arranged that the lowest cost for the entire system can be selected and the relative costs of the other installations readily explained.

Basic Data for An Economic Study

Compressor House Installation
- Capacity of compressor unit
- Cost
- Horsepower
- Pounds of steam per horsepower (water rate) or similar power data
- Inlet and outlet pressures.
- Overall dimensions

Boiler Plant Installation — Where steam-driven compressors are used
- Estimated cost investment of boiler plant per pound of steam
- For operating expenses, cost per thousand pounds of steam

Mains
- Cost per foot laid

This data can be enlarged upon if the designing engineer wishes to supply more details. The above basic type of data is used in this study for convenience in describing the method of procedure.

Compressor House Installation

This should be made up as a unit section of a compressor house of a type normally in local use. It should be that portion of a building required for one compressor using the overall dimensions of the compressor as a basis for the general design, plus the cost of installing the compressor, piping and miscellaneous items. A spare unit should be represented as a percentage of the cost of the above mentioned operating unit. With a compressor house with two machines operating and one spare unit (for breakdown or repairs) 50% should be added to the cost of the operating unit for a spare. Where it is general practice to have three units operating and one spare unit for standby 33⅓% should be added for the spare.

Plate No. 1

MANUFACTURERS' DATA

	Station Pressures 5 Lbs	10 Lbs
Cost of Compressor Unit	$49,165	$71,165
M/hour capacity	1,260	1,260
Horsepower	730	1,342
Steam lb./hour	10,400	17,700

Plate No. 2

CALCULATIONS
Compressor House Installation

	Station Pressures 5 Lbs.	10 Lbs
Cost of unit	$ 49,165	$ 71,165
Installation	50,000	70,000
Building	50,000	70,000
Total	$149,165	$211,165
Spares 33⅓%	50,000	70,000
Total	$199,165	$281,165
10.96% Annual Charges	$ 22,000	$ 30,800
Dollars/M Max. Hour	$17	$25

Plate No. 3

Boiler Plant Installation

	Station Pressures 5 Lbs	10 Lbs
Steam lb./hour	10,400	17,700
15% (auxiliaries)	1,560	2,660
Total generated by Boilers (lbs.)	11,960	20,360
Boiler Plant @ $9.00	$108,000	$183,000
10.96% Annual Charges	$11,850	$ 19,800
Dollars/M Max. Hour	$9	$16

Plate No. 4

Station Installation
Compressor House Plus Boiler Plant

	Station Pressures 5 Lbs.	10 Lbs
Compressor House	$17	$25
Boiler Plant	9	16
	$26	$41

Plate No. 5

FUEL COSTS
40% Load Factor

	Station Pressures 5 Lbs.	10 Lbs.
Steam lb./hour	10,400	17,700
Cost @75c/1000 lbs.	$ 7.80	$13.25
3504 hours (40% L.F.)	$27,300	$46,300
80% Power adjustment factor	$22,000	$37,000
Dollars/M Max. Hour	$17	$29

Multiplying the investment cost by the percentage for annual charges, and dividing the result by the capacity of the operating unit a Dollars/M maximum hour cost index is obtained.

Cost of the Boiler House

This item is frequently omitted in economic pressure studies, because it is reasoned that the compressors are operated from the main boiler plant and hence no additional boilers are required. This is erroneous because each additional compressor, when installed, automatically earmarks a certain boiler capacity of the plant which is required for this compressor. It is therefore necessary to show a definite boiler capacity which can be readily computed from the pounds of steam / horsepower required for the particular compressor quoted by the manufacturers.

No spare units need be shown for standby boiler capacity where the compressor is installed in the main plant if a spare boiler is normally housed for the entire boiler plant installation.

Multiplying the investment cost by the percentage for annual charges and dividing the results by the capacity of the compressor, a figure of Dollars/M maximum hour Cost Index is obtained.

Cost of Steam for Power

The steam consumption is obtained from the manufacturers' data and is the product of the horsepower and pounds of steam per horsepower. The hourly cost of steam would be the steam consumption multiplied by the cost/M pounds of steam generated under the local conditions. This is the item of the study for which the application of the load factor and power adjustment factor is required to convert it to Dollars/M maximum hour. The cost as computed above is the cost of pumping at one maximum hour. By multiplying by the number of hours per year represented by the load factor, a total annual cost is obtained operating under maximum pressure and maximum efficiency. By multiplying the results by the power adjustment factor a total annual cost is obtained, representing the fuel charges against pumping. This figure, when divided by the capacity of the compressor, will give the Dollars/M maximum hour Cost Index desired, for comparison with the other items of capital cost.

In this study the cost of steam at 75 cents/1000 pounds, a load factor of 40% (3,504 hours) and a power adjustment factor of 80%, are used as an example.

Cost of Mains

The cost of mains is dependent upon the nature of the territory to be supplied. In any distribution system rarely are any two main feeder lines from the plant the same size. The plant is usually located near the center of the most densely populated areas, hence any main will have considerable takeoff near the plant and its capacity leaving the plant is higher than capacities normally computed for its entire distance by flow formulas. A factor can be introduced allowing for the take-offs by adding 10% or 20% as the case may be or using the factors provided for in many formulas for mains having takeoffs of regular quantities of gas at regular intervals. This is entirely a local problem but can be expressed in a percentage applied to the flow formulas. By selecting various pressure drops for various subdivisions of the study a table can be set up showing all sizes of mains, their cost per foot, total cost of the average length of the main and their capacity.

Multiplying the investment cost by the percentage for annual charges, and dividing the result by the capacity of the operating unit a Dollars/M maximum hour cost index is obtained.

Plate No. 6

DISTRIBUTION SYSTEM ANNUAL CHARGES
5 Miles

Size of Main	*Per Foot*	*5 Miles*	*9.56% Annual Charges*
4″	$ 4.00	$105,600	$10,100
6″	4.60	121,450	11,600
8″	6.00	158,400	15,100
12″	10.00	264,000	25,200
16″	14.00	369,600	35,400
20″	18.00	475,200	45,500
24″	22.00	580,800	55,500

Plate No. 7

CAPACITY OF MAINS
5 Miles
1 Lb. Terminal 0.65 Specific Gravity
12% Additional for Takeoff

Size of Mains	*Pressure Loss*	
	4 Lbs.	*9 Lbs.*
4″	8M	13M
6″	23	38
8″	48	77
12″	134	215
16″	270	436
20″	460	740
24″	710	1,150

Plate No. 8

COST INDEX—MAINS
5 Miles
Dollars per M—Maximum Hour
(Annual Charges Divided by Capacity)

		4 Lbs Pressure Loss		*9 Lbs. Pressure Loss*	
Size of Mains	*9.56% Annual Charges*	*Main Capacity*	*Cost Index*	*Main Capacity*	*Cost Index*
4″	$10.100	8M	$1.262	13M	$777
6″	11.600	23M	504	38M	305
8″	15.100	48M	314	77M	196
12″	25.200	134M	188	215M	117
16″	35.400	270M	131	436M	82
20″	45.500	460M	99	740M	62
24″	55.500	710M	78	1,150M	48

Plate No. 9

COST INDEX—STATION PLUS FUEL

Station Installation	*Station Pressures*	
	5 Lbs.	*10 Lbs.*
All sizes of Mains	$26	$41
Fuel (40% Load Factor) All sizes of Mains	17	29
Total Dollars/M Maximum Hour	$43	$70

Miscellaneous Items

Additional items which are related to the costs of pumping, and which change with various pressure installations, are as follows:

Unaccounted for gas
Maintenance of pumping units
Maintenance of mains
Lubricating oils, etc.

The above are not mentioned up to this time in the study but will be referred to later when comparisons of pressures are made.

Application of Cost Indices

To demonstrate the application of the preceding method to problems arising in an engineering survey by reducing the costs to Dollars / M maximum hour, the tabulations listed below are for a survey to answer the following problem.

A certain territory within a radius of 5 miles of a compressor station is now served by an installation operating at 5 pounds of four units—one of which must be replaced because of obsolescence. The territory has experienced increase in consumption and also promises considerable future growth. Shall the new unit replacing the obsolete unit be installed for 10 pounds so that ultimately the plant will be able to serve the entire territory at 10 pounds, thereby using the increased capacity of the present mains because of the higher pressures, or shall the unit be replaced by one of the same present characteristics and serve the territory as at present?

To make such an engineering survey, data should be obtained from compressor manufacturers and tabulations made for conditions not only for 5 pounds and 10 pounds as noted in the original question but possibly up to 25 pounds to make sure the study covers an adequate scope.

In the following pages are shown

the manner of applying the method as set forth in the main section of this paper.

The 5 pound and 10 pound pressure conditions are presented for illustration as these are sufficient to show the method of application of cost for various sizes of mains and pressures. It is to be understood that in making a survey of an actual system, additional tabulations for various other pressures should be added in order that the results may be definite.

The annual charges Dollars / M maximum hour of station fuel and mains are the basic figures to determine the proper pressures and mains in designing a distribution system. The cost index and main capacity corresponding to the index are listed below for final study.

As shown graphically in the table a 4" main 5 miles long would deliver 8M feet/hour on the maximum hour, and with a 40% load factor the cost/M maximum hour would be $1,305. The 40% load factor represents 3,504 hours per year times the maximum hour, therefore, the cost/M delivered during the year would be $1,305 divided by 3,504 or 37 cents/M. This represents the cost/M delivered of station installation, mains and fuel for power. For the same reason pumping 710M feet/hour through a 24" main would cost 3½ cents/M. This explains the reason for lower cost of transmission when large quantities are involved.

Upon examination of the above table we find that in all cases where capacities for 10 pounds are listed for one size main, relative capacities occur for a 5 pound system requiring the next size larger main but at a cheaper cost index.

To analyze these cost indices therefore consider two cases where a predicted load of 13M/hour and one of 215M/hour are required for local systems. A rearrangement of the cost indices for the 12" and 16" mains to supply 215M/hour is shown below for the purpose of illustrating the actual cost/M delivered by the 12" fully loaded main and by the 16" partially loaded main. It will be observed that the 16" main will cost $105,000 more than the 12" and its cost/M for 215Mcf is 5.90 cents/M delivered at 5 pounds, an increase of .55 cents/M over the cost of delivering gas by the 12" main at 10 pounds pressure. When the 16" main delivers 31M/hour more than the estimated consumption the cost delivered is 5.35 cents/M—exactly the same as the 12" at 10 pounds and there is still an additional capacity of 24M/hour, at which time the cost delivered will be 5.00 cents/M.

It is also to be remembered that other factors, such as unaccounted for gas, maintenance of units, maintenance of mains, and additional cost of lubricating oils are not shown in this study; all these items happen to be greater for the 10 pound system than for the 5 pound system. Should these items be added to the study, the .55 cents/M additional cost of the 16" would be less, thereby making the costs of the 16" and 12" more in line than actually shown.

It is also to be observed that the eventual cost for delivering gas in the 16" will be 5.0 cents/M when the capacity is fully reached, whereas the cost in the 12" main will never get below 5.35 cents/M. Therefore the designing engineer from his knowledge of the territory can readily determine about how long conditions will continue before the 16" is actually cheaper than the 12" for a long range program.

A second analysis for the 13M/hour can be made from the cost indices and will show that the 4" main will deliver this amount under a 10 pound system. It is also observed that a 6" main is cheaper under 5 pounds should this capacity reach 23M/hour. In order to determine when the 6" will be the same cost/M as the 4" a similar tabulation can be made for these two mains as shown below.

By analyzing the above information the cost for the 4" will be 24.2 cents/M. The 6" main will cost $15,000 more and will cost 26.8 cents/M delivered, or 2.60 cents/M more than the 4" main. However, by increasing the demand on this main from 13M/hour to 14.4M/hour (which is an increase of 1,400 cubic feet) the cost of the 6" and 4" are the same and there is 8.6M/hour additional capacity in the 6" which when fully loaded at 5 pounds will be delivered at a cost of 15.6 cents/M or 8.6 cents/M cheaper than the 4" at 10 pounds.

All the figures above are for a 40% load factor.

In considering the latter group of costs it will be noted that the cost of the compressor such as used in this study is a rather large and efficient type. It is not quite applicable to such low capacities as may be required on the 4" main which would be fed by compressors of smaller capacity. Compressors of small capacity are usually less efficient and the cost/M capacity is higher. For this reason they will give more unfavorable differential costs than the cost of installation plus fuel as shown in the example.

By comparing all the above data practically nothing is gained by installing a 10 pound station even with the present high cost of materials for

(Continued on page 36)

Plate No. 10

COST INDEX—TOTAL
5 Miles
40% Load Factor
Summary of Station, Fuel and Mains

Size of Mains	Mains Cost Index Pressure Loss		Cost Index Total Station Pressures	
	4 Lbs.	9 Lbs.	5 Lbs.	10 Lbs.
4"	$1,262	$777	$1,305	$847
6"	504	305	547	375
8"	314	196	357	266
12"	188	117	231	187
16"	131	82	174	152
20"	99	62	142	132
24"	78	48	121	118

Cost Index Station plus Fuel
5 lbs. station $43
10 lbs. station $70

Plate No 11

RELATION OF TOTAL COST INDICES
and
CAPACITY OF MAINS
5 Miles

Size of Mains	40% Load Factor 5 Lb Station		10 Lb. Station	
	Main Capacity	Cost Index	Main Capacity	Cost Index
4"	8M	$1,305	13M	$847
6"	23M	547	38M	375
8"	48M	357	77M	266
12"	134M	231	215M	187
16"	270M	174	436M	152
20"	460M	142	740M	132
24"	710M	121	1,150M	118

Plate No. 12

COST USING MAINS OF PARTIAL CAPACITY

Size of Main	Total Cost	Annual Charges
12"	$264,000	$25,200
16"	369,600	35,400

Station Pressure	Size Main	Capacity M/hr.	Cost Index Mains	Station and Fuel	Total	c/M
10 lbs.	12"	215	$117	$70	$187	5.35c
5 lbs.	16"	215	164	43	207	5.90
5 lbs		246	144	43	187	5.35
5 lbs.		270	131	43	174	5.00

Plate No. 13

COST USING MAINS OF PARTIAL CAPACITY

Size Main	Total Cost	Annual Charges
4"	$105,600	$10,100
6"	121,450	11,600

Station Pressure	Size Main	Capacity M/hr.	Cost Index Mains	Station and Fuel	Total	c/M
10 lbs	4"	13	$777	$70	$847	24 2c
5 lbs	6"	13	895	43	938	26 8
5 lbs		14 4	803	43	847	24 2
5 lbs		23	504	43	547	15 6

Pressure Control and Other Problems of Long Line Gas Dispatching

By
A. L. Bristow
Northern Natural Gas Company
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TO MY KNOWLEDGE there is no standard guide for Gas Dispatching that can be applied to all gas pipe line systems. Each company must develop a system of dispatching that will best coordinate the many and varied functions of its system. However, there are some basic fundamentals of gas dispatching that are applicable to all gas pipe line systems.

The chief function of a dispatching department is to coordinate the activities of the various operating departments, including Production, Pipe Line, Compressor and Distribution, so far as the delivery of gas is concerned, to efficiently utilize the capacity of the gas system.

Briefly, a dispatcher is the same as a doctor to a gas pipe line system inasmuch as he is the first party notified, day or night, when trouble or an emergency occurs, and it is his responsibility to assist the various other departments in making necessary repairs and resuming normal operations as expeditiously as possible.

The Production Department must be advised in advance each month of the daily system requirements in order that necessary prorations of gas from various fields can be adequately allocated. An extensive study of daily requirements by months for one to two years in advance is also necessary in order that negotiations may be made to assure an adequate supply of gas for new capacities when available. After receiving the requirements data, the production department, in turn, furnishes the dispatching department with an average daily allocation schedule. It is then the dispatching department's responsibility to comply with this monthly schedule as accurately as possible.

Co-operation Necessary

It is very necessary for the dispatching department to work harmoniously with the pipe line department, assisting not only in the repair of pipe line failures and the arrangement of schedules for cleaning but also in the testing of lines above normal operating pressures to assure maximum capacity and reduce the possibility of line failure during the winter months. The schedules should be arranged, if possible, at times when load conditions are such that curtailment of gas to industries will not be necessary or at least when such curtailment would be at a minimum.

The Dispatching Department must also cooperate with the Construction Department in arranging schedules for blowing, purging and connecting new lines.

Furthermore, it is necessary to assist the Compressor Department by studying the most suitable operating pressures, issuing orders accordingly and balancing pressures between stations to permit the most efficient and economical operation possible. Station shutdowns must be arranged to permit the cleaning of cooling systems annually as well as to connect new engines when installed. An annual summer overhaul schedule must also be arranged whereby the system capacity will be affected as little as possible. It is through close cooperation with the compressor department that pressure control is efficiently effected.

Pressure Controls

In discussing pressure control and other problems of long line dispatching, all experiences will be confined to the Northern Natural Gas Company's system; which operates approximately 3800 miles of pipe lines with diameters ranging up to 26 inches, through the seven states of Texas, Oklahoma, Kansas, Nebraska, Iowa, South Dakota and Minnesota. There are 17 compressor stations on this system housing approximately 116,000 horsepower. This system serves 219 communities having a total population in excess of 2 million people, with approximately 500 thousand customers. The present calculated capacity north of the state of Kansas is 390 million cubic feet of gas per day for the principal market area of the company in the states of Nebraska, Iowa, South Dakota and Minnesota. Markets in the state of Kansas currently require an additional 25 million cubic feet of gas during days when low temperatures are experienced.

The days when dispatching was a job of periodic checking of pressures and turning on more gas from fields of supply as colder weather occurred are history.

Due to the shortage of steel for pipe and other necessary equipment to increase capacities to meet the abnormal growth of requirements, effected primarily by the increase in the cost of other fuels, the dispatching department has become one of the most vital departments of a gas system. The full utilization of the capacity of a system, and therefore the sale of gas by the company, is directly effected by experienced supervision of an adequately trained dispatching department.

The Northern Natural Gas Company's annual capacity factor was 92% for the year 1947. This was accomplished by the full cooperation of the dispatching department with all the other operating departments and adherence to the slogan, "If you don't sell it today, you cannot sell it tomorrow."

Compressor stations on the Northern Natural Gas Company system are operated at discharge pressures ranging from 450 to 700 lbs. The load characteristics on this system are constantly changing. Aside from the influence of weather conditions, there are plant shutdowns caused by overhaul, seasonal requirements, and other factors inherent to the many types of industries served, which must be studied and considered.

Curtailment of interruptible customers has become one of the chief functions of the dispatching department. As an example, during the 1942-43 heating season interruptible customers were curtailed approximately 5% of their total requirements, as compared to approximately 35% curtailment of their total requirements for the past heating season. However, the system capacity has been increased approximately 60% since the end of the war.

In March of this year, during a short cold wave, the system requirements north of the state of Kansas were estimated to be 630 million cubic feet of gas for a 24 hour

period. This demand, when compared with a capacity of 390 million cubic feet, clearly indicates the large amount of curtailment required. The difference between Sales and Requirements represents the routine curtailment of deliveries of gas to large volume industrial consumers, purchasing natural gas on an interruptible basis, who are equipped to burn coal, oil or other fuels in place of gas, and who use such other fuels regularly when deliveries of gas are curtailed.

Temperature Variations

There are days when temperatures vary as much as 30 degrees in different areas at the same time, and the following day these conditions have been reversed. With varied weather conditions of this kind, it is not unusual for the system gas requirements to vary over 100 million cubic feet from day to day.

Snow, rain, clouds, wind and sunshine are also important factors to be considered in gas dispatching. From experience it is concluded that winds up to 10 miles per hour are of little concern as this is the normal prevailing wind velocity in the area served by Northern. However, in dealing with wind velocities of 35 to 45 miles per hour, it is our practice to allow a temperature variation of 10 to 15 degrees to insure safe pressure control in dispatching. This procedure might not conform to other gas pipe line systems since the heating load per degree of temperature, combined with the industrial requirements of a system, has a direct effect on these conditions.

It has also been observed that temperatures of 30 degrees above zero on a damp cloudy day require approximately as much gas for heating as temperatures of 20° above zero on a bright sunny day. It has also been observed that the radiation from the sun is much more effective in the spring than during the winter months.

With all the various weather conditions and their combinations affecting the gas demands on a gas pipe line system, it is needless to say that a dispatcher requires all the weather information available. This is essential in order to calculate the daily requirements and consequently be able to estimate how much load above the system capacity will require curtailment.

Weather Forecasts

The dispatching department receives a twenty-four hour forecast, also a five day long-range forecast twice a week for the market area served. In addition to these forecasts, the local U. S. Weather Bureau furnishes a copy of their weather charts showing the prevailing weather conditions for some 500 key points throughout the U. S. and Canada. These are compiled every six hours and are received by special delivery within two hours after completion.

By radio, it is possible to obtain from the local airport, an hourly airline broadcast by the Civil Aeronautic Authority Airway Weather Bureau, the temperature, dew point, wind direction and velocity, along with other general weather conditions, for many key points throughout the market area. By these radio reports it is often possible to observe the movements and intensity of cold waves as they approach the market area. Many times, a severe cold wave can be observed approaching the market area as much as 12 hours ahead of the prediction made by the forecasts.

With all of the above weather information, along with load charts and graphs, gas dispatching should be simple. This is far from true since Weather Forecasters are not infallible. During a twenty-four hour period the forecasted temperatures often vary as much as 30 degrees from the actual temperatures. It is not uncommon to have rain or snow when fair weather has been forecast. Recently we received a forecast for snow flurries and actually received a 30 inch snowfall.

However, the government forecasts are remarkably accurate on a percentage basis, although the possibility of their missing keeps a dispatcher constantly on the alert.

Many times these variations require the curtailment or release of gas for industrial consumers all hours of the day or night in order to maintain adequate operating pressures on the gas pipe line system.

New Form of Contract

A new form of Contract Demand Rate was developed and made effective by the company for the billing month of November, 1947. This new rate consists of a demand charge and a commodity charge, replacing the previous firm gas charge and interruptible gas charge. This revised schedule has greatly aided dispatching inasmuch as it has retarded the excessive additions of new loads until adequate capacities are made available.

By this method the system capacity was allocated to the utilities based on the previous year's firm gas demand.

Some of the utilities do not have sufficient industrial loads to utilize their allocated demand during warmer weather, thereby creating excess gas for other utilities with industrial loads in excess of their contract demands. This over-run gas is released or curtailed by six priority steps which are ordered into effect by the dispatching department. Since the system covers such a large market area with varied weather conditions, curtailment orders are issued by zones. All utilities within a zone receive the same order for a certain step of curtailment; however, utilities in other zones may receive an order for a higher or lower step of curtailment. This procedure allows flexibility in pressure control and better utilization of the system capacity.

The schedules contain a penalty clause under which a utility using more than its contract demand on a day when such demand has been ordered into effect, is required to pay a penalty of $10 per thousand cubic feet for any gas taken in excess of the contract demand, unless such penalty is waived for good cause.

Any monies so obtained are to be distributed as a credit to other utility customers and not retained by the company.

The purpose of the penalty provision is to assure equitable distribution of supplies on days of low temperature and, thereby, prevent any gas shortage which might result from excessive takes on the part of a gas utility.

This type of schedule has been very educational for most of the utility customers. Under the new schedule, it became necessary for each utility to make an extensive study of their load conditions and prepare graphs or other data showing their summer base load requirements, along with the heat loads and industrial customers' requirements. This information requires the reading of all large industrial meters daily. In other words, the utilities now have to be gas-minded and dispatch their own gas requirements, whereas before, they would only curtail certain classes of industrial loads when ordered to by the company's dispatching department. This resulted in each utility having to train and assign the dispatching duties to one or more men within their companies.

System Control Curtailment

Instead of system control curtailment of industrials by classes, the dispatching department now must first check weather data for the system, and then decide what steps of curtailment above the contract demand are necessary for the various zones. These orders are then phoned to some thirty-five utility customer dispatchers, who in turn must check the local weather forecasts and numerous gas load charts in order to decide how interruptible gas in this particular step can be carried within their contract demand and what portions must be curtailed. This has been one of the major problems encountered by the dispatching department this first year of operation under these new schedules. However, these difficulties should be less in the future as every one becomes more familiar with the procedures.

All these difficulties resulting from the inability of the various utility company dispatchers to comply accurately with all curtailment orders were more than justified by knowing that when contract demand or step six was ordered into effect, after ordering all the other curtailment steps into effect, the pressures would begin to increase regardless of weather conditions prevailing. This is a great relief to any gas dispatcher.

During the severe storm that most of the nation experienced during the past February, when many towns were without gas completely and many small non-interruptible plants were made idle, we did not experience a single gas failure. Furthermore, we did not have a single plant shutdown on our system.

These results should be convincing to anyone that a contract demand schedule is one of the better schedules for good pressure control and dispatching, thereby protecting firm gas requirements and assuring equitable distribution for all utilities on a gas pipe line system.

In conclusion, I would like to say that gas dispatching is one of the most interesting and fascinating departments of the gas industry, always realizing that the welfare of all the people in the entire market area are directly dependent upon the decisions made and orders issued by the dispatching department. With the many variables affecting dispatching, there is never a monotonous moment in this work. Every day the problems of pressure control and gas dispatching are different.

However, an efficient dispatching department must have the harmonious cooperation and good will of all other employees of the company. This department should create good public relations and command the confidence of all utility customers, thereby assuring fulfillment of all curtailment orders as issued from time to time.

Presented at American Gas Association, Natural Gas Department Meeting, Houston, Texas May 4 and 5, 1948.

Rheem Appoints Two New Vice-Presidents

Clifford V. Coons has been appointed vice-president in charge of sales and G. M. Greenwood has been named vice-president and treasurer of Rheem Manufacturing Company, it was announced July 13th by R. S. Rheem, president.

Joining the Rheem Company in 1934 as a timekeeper at the Richmond (California) plant, in 1939 Mr. Coons rose to the rank of manager of the Houston (Texas) plant. In 1941 he went to New York as manager of container sales and since 1945 has been general manager of sales. He will continue to make his headquarters in New York.

Mr. Greenwood, who joined the Rheem Company in 1941 as treasurer, was made a member of the board of directors later that year. He will continue to be located in the company's San Francisco offices.

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WILL LAST LONGER WITH

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Now you can tell your customers that the storage tank will last twice as long as heretofore. That is, if you insert an "Elno" — the magic magnesium-alloy rod — into the storage tank.

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THE CLEVELAND HEATER CO.
2310 Superior Avenue Cleveland 14, Ohio

Gas Crews at Portland, Oregon Restore Service to Vancouver, Wash. Following Columbia River Flood

EXCEPT for the break in the gas main to Vancouver, actual damage to Portland Gas & Coke Company propedties during the recent flood was not serious compared with the flood of 1894 which caused the only system-wide interruption of gas service since it was started in 1860 by what then was the Portland Gas Company.

The new plant was completed on N. W. St. Helens road in 1913 on a ground elevation to withstand a 34-foot flood stage.

Less than 48 hours after Distribution bureau crews started their history-making job of getting gas to Vancouver after failure of the Union Avenue fill June 1, gas was flowing northward through 7,000 feet of temporary main, 700 feet of it under water.

Utilization bureau crews, as soon as the mains were purged of air, began their big job of calling on the approximately 4500 customers to make turn-ons and check individual appliances. Each service had been turned off at curbs or meters while repairs were made.

Service was restored first to hospitals, restaurants and other places serving the public needs. Customers were surprised as well as pleased at the speed with which gas service was resumed.

All available men, trucks and equipment were quickly mobilized for the job, working around the clock by means of lights operated by storage batteries and portable generators. A tug, barge and a skiff hauled men and equipment across the water, through wreckage from Vanport, and the first men across discovered a smaller break which also had to be bypassed.

The laying of 7,000 feet of main to cross 700 feet of water is accounted for by the fact that the old main was accessible only at the end of the fill to the south and the Columbia slough bridge to the north. For the "dry land" part of the operation, six-inch "invasion type" main was laid along the shoulder of the highway just outside of the guard rail.

The under water part of the job was handled by Gilpin Construction Company with its facilities for marine operations. Welded sections of main were pulled from the shore by a barge which worked its way across by cable, allowing the pipe to settle to the bottom as it went.

A.G.A. Adopts Calendar Year for Accounting

Members of the American Gas Association almost unanimously approved two amendments to the Constitution having the effect of changing the Association's accounting year from the year ending September 30 to the calendar year. The term of office for elected officers and directors will remain as at present. The change in the accounting year was recommended by the Executive Board so as to conform to the general practice of member companies.

As a result of the amendments, annual dues of all A. G. A. members are due on January 1. In making the change, company members will first be billed for the three-months period, October 1 to December, 31, 1948. Subsequently they will receive bills to cover the 1949 calendar year. Individual members will be billed to cover a 15-months period from October 1, 1948, to December 31, 1949.

1: Columbia River flood waters that destroyed the City of Vanport also washed out this 700-foot section of Pacific Highway fill which carried Portland Gas & Coke Company's main to Vancouver, Wash. Restoring it across this 700-foot gap, with water as deep as 50 feet, was a problem that presented itself at 2 A. M. June 1.

2: A temporary gas main to Vancouver was in service in a little over 48 hours after the break, even though it was necessary to lay a total of 7,000 feet to reach accessible main at either end. As for the actual break, 700 feet of welded pipe, in sections, was pulled across by barge and allowed to settle to the bottom, as deep as 50 feet.

3: Men, pipe and equipment had to be ferried across 700 feet of water, through debris from Vanport, to work on the north side of the break. Gas service was restored to Vancouver in a little over two days of working around the clock. It was two weeks before even restricted traffic could use the highway.

4: This second break in the highway fill was a "surprise" problem that confronted Gasco crews when they forded the big break. The answer was a zig-zag in the temporary main to utilize a narrow section of fill that remained. A few days later it was replaced by 50 feet of underwater main to avoid crossing the highway.

EMERGENCY CREWS RESTORE GAS SERVICE TO VANCOUVER, WASHINGTON, IN TWO DAYS

Canadian Gas Association Meeting at Jasper a Success

Notwithstanding the very long distances which many delegates had to travel to reach the 41st Annual Convention of the Canadian Gas Association, held at Jasper Park Lodge, Jasper, Alberta, Canada, June 30, July 1, 2 and 3 last, they nevertheless came in numbers to around 300, from many parts of the United States, coast to coast, and from many parts of Canada, to take in this attractive and worthwhile meeting held in one of the most beautiful parts of the Canadian Rockies, 200 miles west of Edmonton, Alberta.

It was a real Convention, and in such a beautiful part of the Rockies that many of the members brought their wives along, and there is no question but everyone enjoyed themselves to the full.

Mr. Alexander MacKenzie, Sales Manager, General Steel Wares, Ltd., of Toronto, was elected president for the ensuing year. He is the second manufacturer which the Canadian gas men have elected to this high office in some 41 years. Serving with him for the term will be C. M. Seiger, of Hamilton, first vice-president; Hugh G. Smith, Toronto, second vice-president; and G. W. Allen, Toronto, executive secretary and treasurer.

Papers were read by many prominent gas men, among these might be mentioned:

G. M. Blackstock, Chairman, Board of Public Utility Commissioners, and Chairman, Natural Gas Utilities Board, Province of Alberta, Edmonton, Alberta.

H. R. Miner, President, Canadian Western Natural Gas Co., Ltd., Calgary, Alberta, and President, Northwestern Utilities, Limited, Edmonton, Alberta.

T. M. Moran, Vice-President, B. C. Electric Railway Co., Ltd., Vancouver, B. C., and E. H. Rohrer, Mgr., Gas Division, B. C. Electric Railway Co., Ltd., Vancouver, B. C.

Kenneth Stookey, President, The Gas Machinery Company, Cleveland, Ohio.

C. A. Renz, Mgr. of Customer Service, Southern California Gas Co., Los Angeles, Calif.

Miss Jessie McQueen, Home Service Counselor, American Gas Association.

K. B. Anderson, Engineer of Operations, Coast Counties Gas and Electric Co., Santa Cruz, Calif.

J. D. von Maur, Consulting Engineer, Consumers' Gas Co., Toronto, Ont.

Among the well-known Americans who attended the Canadian meeting included the following:

Hudson W. Reed, President, American Gas Association; A. H. Sutton, President, Pacific Coast Gas Ass'n.; John H. Robertshaw, President, Gas Appliance Mfrs. Association; H. Leigh Whitelaw, Managing Director, GAMA; Clark Belden, Executive Secretary, New England Gas Association; Clifford Johnstone, Managing Director, Pacific Coast Gas Association, and others.

THE GILD GATHERS AT JASPER PARK

One hundred per cent attendance marked the traditional breakfast of the Gild of Ancient Supplers held at Jasper Park Lodge during the Canadian Gas Association annual convention. Seated, left to right, are: K. M. Clark, J. M. Moffatt, G. F. Knight, G. S. Jones, Mayor J. A. Mulcare who presided and outlined plans for the annual Wassail to be held at the American Gas Association convention Oct. 4, J. A. Robertshaw, and A. H. Sutton. Standing are: Clifford Johnstone, C. B. Dushane, H. L. Whitelaw, F. L. Fairchild, J. I. Gorton, Norton McKean, A. F. Benson, J. H. Lewis and F. H. Boezinger.

Alexander MacKenzie
Pres. Canadian Gas Assn.

New Ejector Regulator

A new bulletin describing the mechanical construction, operating principles and performance characteristics of ejector service regulators has been issued by the Pittsburgh Equitable Meter Division, Rockwell Manufacturing Company, Pittsburgh.

The exclusive Emco ejector principles of automatic loading is fully discussed and graphically presented with flow stream diagrams. Large section views show component parts.

Complete specifications, including capacities, outlet pressure adjustment range, dimensions, weights and list prices are included in tabular form.

Of interest to repair shop men is a convenient parts list with parts illustrated by means of isometric projection drawings. The illustration sequence makes it easy to assemble the regulators in any maintenance operations.

Copies of the bulletin can be obtained from the Pittsburgh Equitable Meter Division, Rockwell Manufacturing Company, Pittsburgh 8, Pa. Ask for bulletin 1026.

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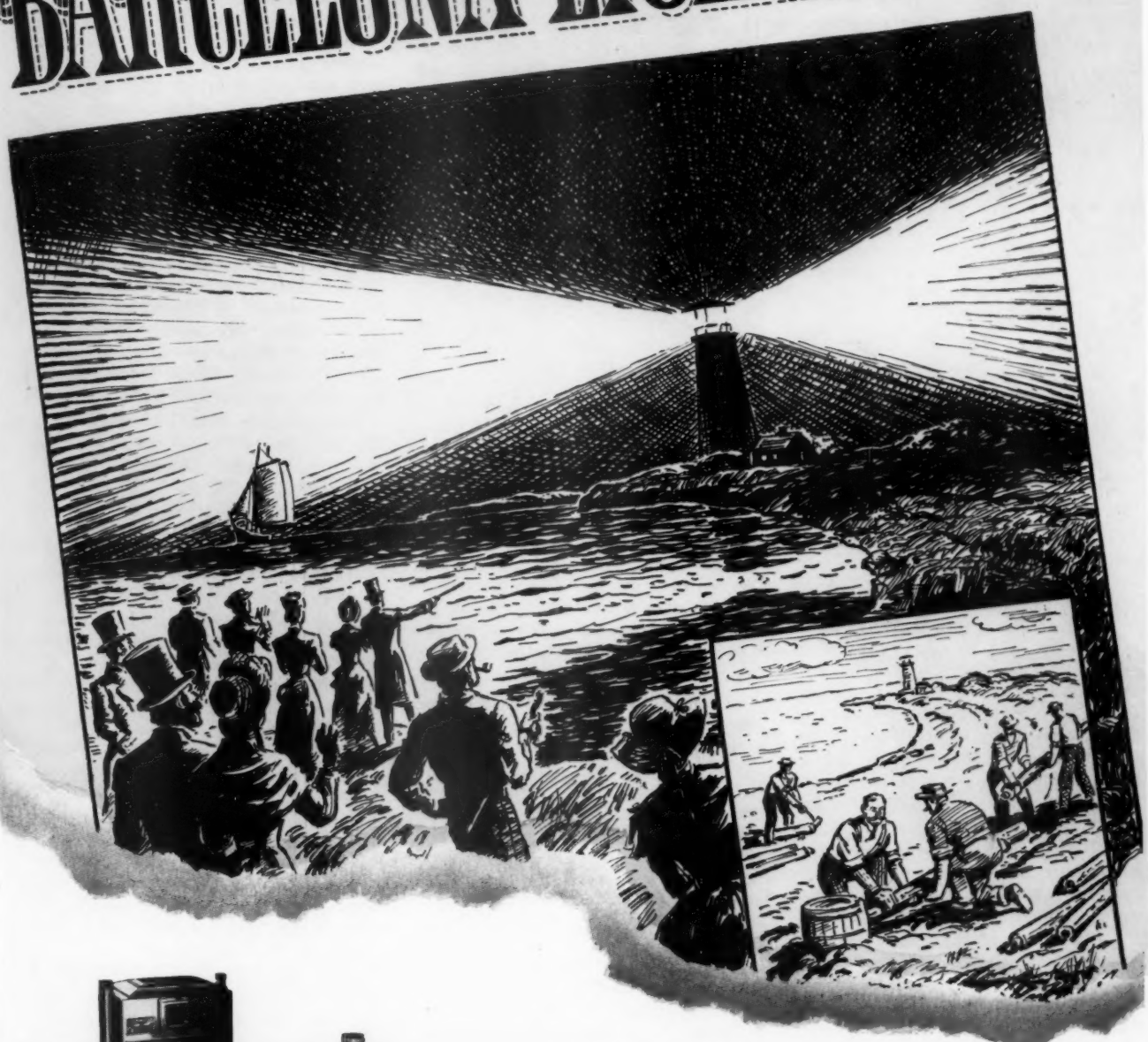
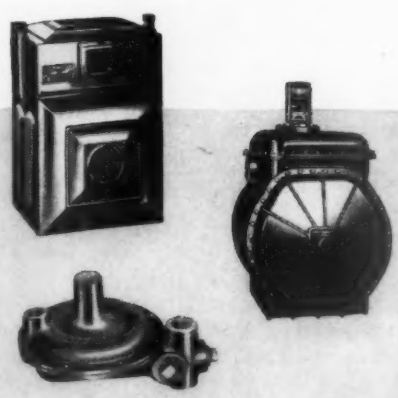
Ingenious Half-Mile Pipeline Supplies Beacon
WESTFIELD, N. Y., 1828—Great numbers of the populace thronged the shores of Lake Erie last evening to marvel at the new brilliance of the lighthouse at Barcelona Harbor. The unusually bright and steady beacon light is made possible by the burning of Natural Gas which is piped to the lighthouse through a line, ingeniously constructed of pine logs, from a gas spring a half-mile away in Westfield Creek.
The U. S. Government Lighthouse Service is to be congratulated for its pioneering in the utilization of the wondrous properties of gas from the ground.
d steady beacon light is
ing of Natural Gas which
e at Barcelona Harbor.

Distribution has come a long way since the early engineers of Westfield sealed a fish barrel gasometer over their gas spring and ran their pine log pipeline to Barcelona Light. This early half-mile line has grown to more than 320,000 miles of gas pipelines and gas mains. Teamed with accurate measurement, they provide the vital link between gas wells, gas holders and over 21,000,000 customers. And it is the proud pledge of the distribution engineers that this vital link shall never be broken, come storm or flood or bitter cold.

Since the early days of the gas industry it has been our privilege to work with the distribution engineers by providing accurate, dependable measurement. And, as the industry grows to still greater heights, American Meter Company will continue to aid in meeting each new measurement problem through research and progressive manufacturing techniques.

BARCELONA LIGHTHOUSE





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Large Volume Water Heating

By
Malcolm B. MacKay
The Burkay Company

Initial Installation of Water Heaters and Water Heating Systems—(Continued)

CHAPTER VIII—PART 5

(22) In addition to employing the correct lay-out and connection of Recovery Circulating Water Lines, there are several other details of system design which *must* be incorporated in the piping and other lay-out of recovery type water heating systems if such systems are to satisfactorily *supply* the full, potential capacity of hot water and *maintain* a uniformly stable hot water discharge temperature.

(a) Where the Hot Water Fixtures in a building are supplied from a "Circulating Loop" to expedite the delivery to each fixture and avoid waiting until the hot water supply line has been purged of cooler water before hot water from the storage tank of the System is available, the return line from the Building Circulating Loop (S) should be connected to the cold water supply line (E) as shown in Figure 14-D.* A Swing Type Check Valve *must* be installed in the return line from the building circulating loop at a location as close as possible to the point where this line connects to the cold water supply line in order to prevent the possibility of cold water being drawn from a hot water outlet connected to the circulating loop at a point *closer* to the cold water supply line than to the hot water storage tank.

Where the circulation in the Building Loop is Gravity or Thermo-Syphon actuated, all horizontal runs of pipe *must pitch upward* between the hot water storage tank and the highest point in the circulating loop and *must pitch downward* from that point to the point of connection of the return line to the cold water supply line in order to prevent unnecessary restriction of the rate of flow of water through the loop.

Restriction of the rate of flow of water through the recovery loop may result in an excessive loss in temperature of the circulating water due to heat loss by radiation. Where the flow rate is so restricted, the circulation should be accelerated by means of a Circulating Pump of a type similar to those employed in forced circulation, hot water heating systems. The pump should be installed in the return line from the building circulating loop at a point as close as possible to its connection to the cold water supply line.

Where a circulating pump is employed, it should be automatically controlled by means of a direct acting, line voltage aquastat installed in the return line from the circulating loop at a point as close as possible to the circulating pump. This aquastat should be adjusted to operate on a temperature differential of from 15° to 20° F., and should be set to close the electric circuit to the pump when the temperature drops to approximately 15° below the desired hot water delivery temperature and break the circuit to the pump when the temperature of the water in the return line reaches the desired delivery temperature. Continuous operation of the circulating pump is not advisable as many pumps of this type are not designed for continuous operation.

(b) Correct location of the aquastat, thermostat, moment valve or other master temperature control in the hot water storage tank of a recovery water heating system is an important factor in obtaining satisfactory performance of the system, particularly from the standpoint of maintaining the volume of stored, reserve hot water at the highest possible level. This control should be installed in the end of a horizontal or side of a vertical storage tank at a point *midway* between the *center line and bottom* of the tank as indicated in Figures No. 14-C and No. 14-D,* in order to result in starting the heater to replace hot water drawn from the tank when only approximately one quarter of the reserve supply has been used and approximately three quarters (3/4) of the tank contents remain unused. Installation of the aquastat or other temperature control *at or above* the center line of the hot water storage tank results in unnecessarily reducing the potential reserve of hot water to the equivalent of one half of the tank capacity, or less, before starting a heater recovery cycle and replacing hot water drawn from the tank.

(c) The recovery circulating lines interconnecting the water heater and hot water storake tank *must* be connected to independent tappings at or near the top and bottom of the tank. Connection of *any other* water line—hot discharge or cold supply—to a *common tapping* in the storage tank with either of the recovery circulation lines will result in *hindering or diverting* the recovery circulation and consequently, in reducing the recovery capacity of the heater.

(d) The relationship or ratio of heater recovery capacity to hot water tank storage capacity of a recovery type water heating system is determined by the *length* of the period of peak hot water demand as outlined in Part 2 of Chapter VI, preceding. The ability of a recovery type water heating system to satisfactorily supply a specific hot water demand is largely dependent on providing the *correct ratio* of heater recovery to hot water storage tank capacity.

(e) Attention is invited to the fact that cold water "Dip-Tubes" are not shown in the hot water storage tanks in Figures No. 14, 14-A, 14-B, 14-C and 14-D and that the cold water supply line is connected to a tapping in the bottom of the tank. The use of cold water Dip-Tubes in hot water storage tanks is *prohibited* by the building code of several cities while the Code or regulations in at least one State *requires* that cold water dip-tubes be employed. The employment of dip-tubes for introducing the cold water into the hot water storage tank is largely a matter of choice as there is no particular operating advantage to be gained by their use. Where used, they should be so installed that the cold water is introduced into the tank at a point as *close as possible* to the bulb or thermo-sensitive element of the aquastat, thermostat or other temperature control unit installed in the tank.

(f) Relief valves necessary to protect recovery type water heating systems are—in too many instances—under capacitated and are frequently improperly installed.

Temperature (only) relief valves *must* have a rated relieving capacity equal—in B.T.U's. per hour—to the rated recovery capacity of the water heater or heaters employed in the system.

Temperature (only) relief valves should be installed directly in one of the tappings in the *top* of the hot water storage tank. Where a separate tapping is not available for this purpose, the temperature relief valve

* *See diagram in July issue.*

may be installed in the top "run" of a pipe tee, the bottom "run" of which is connected to the tapping in the top of the hot water storage tank by an "All Thread" or "Close" pipe nipple. The hot water supply line to the fixtures should then be connected to the *side outlet* or "Branch" of this tee. It is definitely essential that the bulb or thermo-sensitive element of the temperature relief valve be directly exposed to the main body of hot water in the storage tank or to the hot water in the hot water discharge line to the fixtures at a distance *not greater* than from 2 to 4 inches from the main body of hot water in the storage tank. Where a temperature relief valve is installed at a *greater* distance from the main body of hot water in the storage tank, the delayed opening of the valve resulting from the slow transmission of excess heat from the hot water in the tank to the water surrounding the bulb of the valve, may result in serious damage before the valve functions to relieve such excess temperature.

Pressure (only) relief valves should be installed in the cold water supply line to the hot water storage tank at a point *as close as possible* to that at which the cold water supply line is connected to the tank. The valve should be adjusted to a relieving pressure approximately 15 to 20 pounds above the Maximum, Anticipated, Static Pressure of the cold water supply. Several types of pressure (only) relief valves—particularly those equipped with metallic diaphragms—should *not* be installed in the *top* of the hot water storage tank as the metallic diaphragm may rupture when exposed to excessively hot water.

Combination Temperature and Pressure Relief Valves *must* be installed directly in a tapping in the *top* of the hot water storage tank or in a tee installed in a tapping in the top of the tank in conformity with the directions given above for the installation of temperature (only) relief valves. Temperature and pressure settings for combination valves should conform to those specified above for temperature (only) and pressure (only) relief valves.

Combustion Air and Venting

(g) It must also be remembered that the performance of the water heater in recovery type water heating systems can be seriously handicapped as a result of failure to obtain an adequate supply of air necessary to promote and support the complete combustion of the full, rated input of Gas or other fuel.

Any deficiency in the Air Supply —either primary air or secondary air, or both—will be reflected in a noticeably yellow color of the gas flame and the deposition of soot or carbon on the walls of the combustion chamber and of the heat transfer surfaces within the heater. The loss of thermal efficiency caused by such incomplete combustion of the fuel will not only reduce the potential recovery capacity of the heater but will increase, unnecessarily, the cost of heating the water. The deposit of soot or carbon also acts as an effective insulating medium to further reduce the efficiency of heat transfer to the water. It is well to realize, here, that a 1/16 inch layer or deposit of carbon (soot) is as effective an insulator as ¼ inch thick asbestos board.

Cleaning or removal of carbon from the combustion chamber walls or other heat transfer surfaces without correcting the condition which may be responsible for failure of the water heater to receive the volume of air required to support complete combustion of the gas will effect only temporary relief and necessitate again removing carbon within a comparatively short time.

Lack of sufficient air—both primary and secondary—to support complete combustion of the Gas or other fuel may result, either from a continuous or intermittent back-draft in the flue or chimney or insufficient area of opening or openings to admit the air to the room in which the heater is installed. When a back-draft exists, the necessary volume of air required to support combustion is prevented from entering the combustion chamber of the heater as the back-draft in the flue or chimney prevents evacuation of the products of combustion (flue gas) to the outside air. Chimneys or Flue Pipes *must* rise to a point above the wall or roof line of the building in which the heater is installed or of adjoining buildings.

Where it is impracticable to erect a flue pipe of sufficient height or to connect to an existing, satisfactory chimney, a small flue gas exhauster consisting of a blower and fractional horse power motor may be employed. Flue Gas Exhausters of this type are commercially available and are moderate in cost. The motor of the exhauster may be controlled by the switch in a diaphragm operated control installed in the gas supply line to the heater or by means of the temperature control aquastat in the hot water storage tank of a recovery type water heating system, where this aquastat is employed also to actuate a Solenoid or Diaphragm Type Valve in the gas supply line and/or the recovery circulating pump, if used.

Insufficient size or area of the permanent openings to admit the necessary air supply into the room in which the water heater is installed may result in curtailing the volume of air necessary to support complete combustion of the gas or other fuel. In this connection it is well to remember that approximately 9 Cubic Feet of Air are required to support the combustion of 1,000 B.T.U's. of Gas (approximately 1 cubic foot of Natural gas or slightly less than 2 cubic feet of Manufactured gas).

One Square Inch of free opening to admit the necessary air to the heater room is required for *each* 1,000 B.T.U's. of Rated Gas Input to the heater. Where the heater is installed in a room in which an Exhaust Fan or other forced air ventilating system is employed to exhaust the air from the room, the opening or openings through which air is admitted to the room *must* have sufficient area to permit the admission of an hourly volume of air equivalent to that discharged by exhaust fan *in addition to* the air required to support the combustion of the Full Rated Input of gas supplied to the heater.

(23) The importance of selecting the correct type of Water Heater Installation or Water Heating System and providing adequate water heater recovery capacity as well as sufficient hot water storage capacity to supply *any*, maximum, anticipated hot water demand which may be classified as Commercial or Industrial, should obviously be apparent when we face the realization that the inevitable results of failure to provide sufficient or adequate water heating system capacity are a dissatisfied user or customer and an aggravated service problem for which there is no permanent remedy except the installation of additional system capacity.

Recent developments in the field of sanitation and their effect on the hot water demand factors set up for Restaurants and other Food Service Establishments and on the hot water requirements for Spray Type Dishwashing Machines which were presented in Chapter V under "Mass Feeding Hot Water Demand," will be covered in Chapter IX which will appear in the next issue of the American Gas Journal. Chapter IX will also conclude this series of articles on Large Volume Water Heating.

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"FIFTH BIG JOB FOR GAS ASKING TO BE DONE"

"To all gas men, I commend Servel *All-Year* Gas Air Conditioning as one of the best load builders ever developed for us. Its summer requirements and, consequently, the favorable load factor are particularly ideal. That's why we must gain for this fine product the wide public acceptance and use it deserves."

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Houston Natural Gas Corp.
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"ASSURES VERY DESIRABLE SUMMER GAS LOAD"

"We fully realize the great value of gas-fired summer Air Conditioning. Its improvement of our summer load factor should help offset the tremendous peak loads developed by winter heating. There are several Servel units installed in our area, and many more prospects have requested a survey of their premises."

President
Cincinnati Gas & Electric Co.
Cincinnati, Ohio

"DESIGNED FAR IN ADVANCE OF ANY COMPETITIVE UNIT"

"Simplicity of control, flexibility, and foolproof design are but a few factors responsible for the immediate Servel acceptance in our area. The shrewd commercial buyer sees in the *All-Year* Gas Air Conditioner the elimination of pitfalls found in buying and maintaining competitive electrical equipment."

Vice President
Springfield Gas Light Co.
Springfield, Mass.

"OPENS NEW AVENUE OF REVENUE TO THE GAS INDUSTRY"

"We feel that the Servel *All-Year* Gas Air Conditioner is the only answer to ironing out the summer valley in our load curve. We expect All-Year Gas Air Conditioning to grow like Topsy . . . and become as acceptable as gas cooking, water heating, and refrigeration with our customers."

General Sales Manager
Montana-Dakota Utilities Co.
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"COOLING LOAD IN TEXAS HIGHER THAN HEATING LOAD"

"That's why we have found the Servel *All-Year* Gas Air Conditioner particularly valuable in leveling off the peaks and valleys of our operating statement. Our gas air conditioner quota for this year is higher than ever before, because one-unit heating and cooling creates a strong desire for this unique development in modern living."

President
Lone Star Gas Co.
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"BUILDS GAS LOAD . . . INCREASES PRESTIGE"

"We have 26 jobs in operation in our territory...and all are highly satisfactory in performance, customer acceptance, and in providing substantial revenue for our company. I further recommend that Gas Companies give close attention to the sale of Servel units to small commercial shops."

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. . . say these prominent GAS COMPANY EXECUTIVES

"OFFERS DESIRABLE OFF-PEAK LOAD"

"The All-Year Gas Air Conditioning load can be added to our system without increase in plant investment. It has wide appeal, exemplifies the modernity of gas appliances and gas service, and provides a valuable medium for maintaining customer and public interest in our business."

Vice President
Southern California Gas Co.
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"The Servel *All-Year* Gas Air Conditioner helps to establish a much better load factor over the year by building up the summer valley. This is particularly important in many southern areas such as the one we serve in New Orleans, where the days of the year requiring cooling outnumber those requiring heating."

General Sales Manager
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New Orleans, La.

"PROVES THAT 'GAS HAS GOT IT' "

"Last year, we installed 22 Servel units in Hampton Village—one of the country's largest shopping centers . . . *All-Year* Gas Air Conditioning is of vital benefit to the Gas Industry. It increases our revenue, improves our load factor, and shows our customers that gas is the modern fuel."

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We have, without a doubt, the finest *All-Year* Air Conditioner ever developed...But just having the finest is not enough. It must be pushed...promoted...advertised...NOW! For NOW is the time to cultivate this vast new market.

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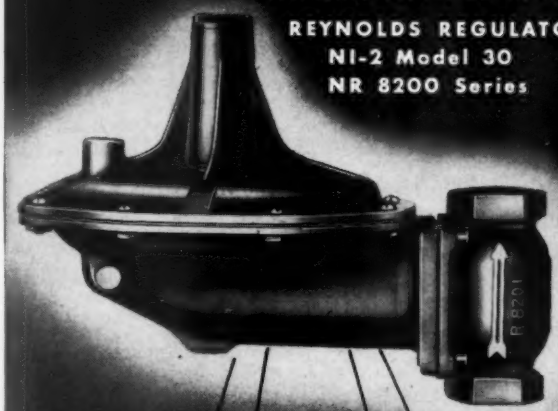
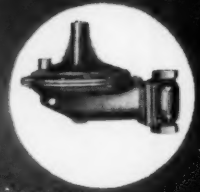
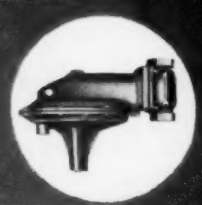


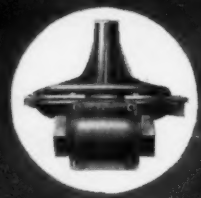


Vertical Position with down flow

Vertical Position with up flow



Inverted Position for use where accumulation of water is problem



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Technical Aspects of the Washington Changeover

By

Frank P. Lamb

Asst. Supt. of Production
Washington Gas Light Co.,
Washington, D. C.

EARLY in 1946, after making long-range studies of probable growth, the Washington Gas Light Company decided that the most economical and practical manner to supply anticipated loads was to distribute straight natural gas of approximately 1100 Btu per cubic foot, instead of the 600 Btu per cubic foot of mixed reformed natural gas and straight natural gas then being furnished to the Washington area. The mixed gas consisted of approximately 70% reformed natural gas, produced in a carburetted water gas machine using gas coal and coke for fuel, and 30% of natural gas as cold enricher.

The 600 Btu mixed gas and the 1100 Btu natural gas, while substantially equivalent in specific gravity, differed considerably in Btu content, chemical analysis and burning characteristics. Because of these differences, it was necessary to develop a changeover procedure in order to properly adapt all appliances for the new gas. It was desired that the procedure should be of the type that would be of the least inconvenience to the customer and, therefore, it was decided to sectionalize the territory so that the conversion of each customer's appliances would be completed the same day that natural gas was admitted to the section.

The area served by the Company and its subsidiaries includes the District of Columbia and the adjoining suburban territory in Virginia and Maryland, all comprising what is known as the Washington Metropolitan Area. In the Metropolitan Area there were approximately 236,000 meters installed, which does not represent the total number of customers, since there are great numbers of apartment houses, multiple dwelling units, governmental units and service industries served by master meters. It is estimated that the 236,000 meters furnish gas to some 300,000 customers using in excess of 700,000 appliances, representing more than 3,000,000 burners.

The appliance conversions in the suburban areas of Virgia and Maryland were completed during the period of August 16, 1946 to November 25, 1946, and in the District of Columbia similar conversion work was completed between April 1, 1947 and October 18, 1947.

The procedure developed for this changeover consisted of four major functions, which were in operation concurrently. Four functions were as follows:

1. **Distribution System—Section Segregation and Purging**
2. **Laboratory Determination of Specifications**
3. **Appliance Adaptation or Changeover**
4. **Publicity**

1. Distribution System — Section Segregation and Purging

The natural gas distributed in the Washington Area is received at a measuring station located on the Atlantic Seaboard Corporation's pipeline at Rockville, Maryland, approximately 20 miles north of the center of the District of Columbia. Two pipelines conduct the gas to three plants, two of which are located in the District and the other, a storage plant, located just across the Maryland State line, and northeast of the District of Columbia. With this type of distribution layout, it was possible to convert the suburban areas in Maryland and Virginia to natural gas, while the 600 Btu mixed gas was distributed in the District.

Since it was desired that appliances be adjusted on the day natural gas was made available, it was necessary to divide the distribution system into numerous areas of such size that each area would contain approximately the number of customers whose appliances the proposed group of adjusters could adapt in a 10-hour day. A card file of all customers was obtained from the addressograph section of the accounting department and these cards were used to set up tentative districts. After tentative districts were indicated on a distribution map, it was necessary to determine, from distribution and feeder main maps, how natural gas could be introduced into the areas and how the mixed gas could be shut off without affecting either gas service after the isolation. This involved studies of the loads within the area, pipe line sizes, pressures and adequacy of gas supply. After the territory was divided into approximately 256 districts, a study of each district's mains was made to determine the method by which complete isolation of each district could be obtained. As a result, some 1300 valves, ranging in size from 2″ to 24″, a few temporary governors and high-to-low pressure connections were installed.

On the day that an area was scheduled to be changed to natural gas, a specially trained purging crew would admit natural gas to the section at 6:00 a.m. and purge the mixed gas from the mains by means of purge pipes at valves separating adjoining mixed gas areas and also at drips and dead ends of mains. A special bunsen type burner had been developed by the laboratory group, for the use of the purge men, to readily identify the kind of gas at a purge location. This burner, when set at 3 inches water column pressure, had a small blue flame with mixed gas and a long luminous flame with natural gas. This purging and customer load between 6:00 and 7:00 a.m. usually was sufficient to insure natural gas at the appliance when the adjuster arrived at 7:00 a.m.

When the district was completely purged, the purging crew inspected all valves, drips and purge points that were involved with the area scheduled to be purged two days later to be certain that facilities were in proper order.

2. Laboratory Determination of Specifications

It has been previously stated that the specific gravity of the former 600 Btu mixed gas and the 1100 Btu natural gas were substantially equal and consequently this factor did not have to be considered in calculating orifice size. However, the difference in Btu content, rate of flame propagation and burning characteristics of the two gases made it necessary to conduct laboratory tests to establish standards for the conversion of appliances to natural gas.

A laboratory was provided in the West Station plant where both the

600 Btu mixed gas and 1100 Btu natural gas were available. Representative types of appliances, new and old, were obtained from manufacturers, dealers and our own storeroom trade-ins and connected for the testing program.

The testing laboratory was arranged with dual manifolding on all four walls, so that either of two gases at any desired pressure could be supplied to any appliance. A flow type calorimeter and a specific gravity balance were set up in the laboratory to provide heating value and specific gravity data whenever required. Carbon monoxide was determined during the first part of the testing by means of the Mine Safety Appliance Company continuous indicator. The National Bureau of Standards detector was used exclusively as soon as the method was available to us. Suitable test meters, pyrometers, and gas analysis equipment were set up at required points.

The first set of tests was run to determine the effect of a variation in natural gas heating value on appliances which had been adjusted on 1100 Btu natural gas. It was felt that this test was necessary because of the fact that the natural gas that is supplied to us varies in heating value from about 1050 to about 1150 Btu per cubic foot. A test gas of 1145 Btu was prepared by mixing small quantities of propane with natural gas, and a 1057 Btu test gas was prepared by removing some of the higher hydrocarbons from natural gas by refrigeration. The tests on sample appliances, with these two gases, showed generally satisfactory results.

The next problem was the determination of orifice sizes, port sizes, and other changes to be made for the conversion of all types of appliances, with particular attention to the more critical types. Orific sizes in general were determined by burner rating except where it was necessary to underrate certain types of burners where the carbon monoxide evolved at full rating was over the A.G.A. limits. Correct port size was determined by observing flame character, particularly with respect to lifting, since natural gas has a lower flame velocity than our manufactured gas. It was found that most appliance burners operated better with an increased port size, both from a lifting and flame character standpoint. In some cases, it was necessary to increase the venturi throat area to eliminate yellow tips.

As the conversion progressed, many appliances were found to require special treatment. Several types of ranges showed considerable streaming, or partial lifting on the top burners, especially when the oven was operating. It was found that the combustion products from the oven were leaking from the upper part of the oven door and other openings and were either entering the burner with the primary air or fouling the secondary air with inerts. After considerable work, this trouble was eliminated to a large extent by sealing the openings or installing baffles.

Another problem encountered was the ignition of range top burners from the pilot. Natural gas has much narrower inflammability limits than our manufactured gas, which necessitated a rather careful adjustment of primary air-gas ratios on some appliances in order to obtain rapid ignition. To determine the correct settings quickly, a combustible gas indicator was converted to a high speed flow type gas-air ratio analyzer. This permitted the determination of gas-air ratios under flowing conditions, using a sample small enough so that the mixture in the ignition tube was not changed.

It was also considered advisable to investigate the stability of pilot flames burning natural gas versus manufacured gas, because of the lower flame velocity of natural gas and resultant lifting effect. This is important from a service viewpoint, where an unstable pilot flame may result in frequent service calls. We, therefore, found it necessary to devote special attention to the conversion of pilots to insure stability under normal operating conditions. The multiport type of pilot proved to be more stable than the single port type. Other special testing included investigation of pilot operation and appliance performance at 50% and 125% of rated inlet pressure.

In all testing, special care was taken with carbon monoxide determinations. The unvented appliances, particularly, were subjected to numerous tests of all kinds to ascertain their possible carbon monoxide output under various operating conditions.

Refrigerators were checked thoroughly to find the most convenient procedure for conversion, without depriving the consumer of refrigeration during the actual conversion period. As a result of this investigation, refrigerators were placed and locked at minimum flame setting by the adjuster on his first visit to the premises on the morning of conversion of a section, and then later in the day a special refrigerator adjuster replaced the burner assembly with a natural gas assembly.

As a result of the laboratory work, a manual was prepared indicating the proper method of conversion of all types of appliances by specifying the proper orifice size, port drill size, replacement of parts that could not be properly adapted and other information that would serve as a guide for the adjuster in the field. The effect of the laboratory standardization and the compilation of the conversion manual was to insure efficient operation of customers' appliances and, in addition, increase the productivity of the adjusters in the field.

After conversion had started, spot checks of all types of appliances in each district were made by the laboratory group (1) to determine that specifications were followed, (2) to obtain further information for improving the specifications, and (3) to give special attention to those appliances which were difficult to adjust.

3. Appliance Adaptation or Changeover

In formulating the conversion procedure, which included the provision that each district be converted the same day that natural gas was turned in, it was realized that the appliance changeover, with its attendant materials and labor procurement, presented a large problem—one which would have been difficult for the company organization to handle. Therefore, we contracted with a company, engaged in this specific type of work, to make the conversion of customers' appliances.

Representatives of this company assisted in the compilation of the conversion manual and the establishment of standards, and with this information as a basis, ordered materials and tools required for the conversion of the suburban properties in 1946. Since time did not permit a survey of requirements, excess material was secured for this initial work with the realization that it would be used in 1947 when the greater amount of conversion would be done. For the latter year's work, a spot survey of approximately 10% of domestic customers and all commercial and governmental users was made during the winter from November, 1946 to March, 1947 to determine more accurately the material requirements.

The contractor had available a nucleus of men, well experienced in conversion work, who trained instructors, crew foremen and directed

field activities under the supervision of a job superintendent. The adjusters, who were hired locally, were assigned for training in one of the following specific groups, namely, domestic, house heating, refrigeration, and commercial and industrial. The training of adjusters consisted of two weeks' instruction on appliances in the laboratory, company policy and other pertinent information, followed by field work with an experienced adjuster or crew foreman.

Several weeks were required to build the organization up to full complement and because of that the districts, for natural gas "turn in," in the early part of both the 1946 and 1947 conversions were planned to cover approximately 600-800 customers. The number of customers per district was progressively increased and for the District of Columbia averaged 1300 per day .

The adjusters met their crew foreman at a designated location within the district on the morning of natural gas "turn in" at 7:00 a.m., at which time they received the conversion work order forms for the customers whose appliances were to be converted. A visit was made to each premises, the cusomer advised how to use the appliance pending conversion later in the day and a survey of all appliances taken to be certain that orders had been issued for special appliances such as refrigerators and house heaters. After reporting to the crew foreman, the latter then divided the work among the adjusters based on the number of appliances involved. A "follow up" check on the efficiency of the adjusters' work was made later in the day by the crew foreman or an inspector.

In the event that admission to a premises could not be obtained, after two or three visits prior to 11:00 a.m., a report was made to the gas company and a gas company employee, who was assigned to that work in conjunction with the conversion, was informed by short wave radio to visit the premises again and if the customer was not at home to shut off the gas at the meter, service stop or install a stop in the service. The meters shut off were approximately 0.49 percent and the service stopcock installations 0.12 percent of total meters in service.

4. Publicity

The efficiency and smoothness of a changeover, of the magnitude such as completed in Washington, depended in a large measure on the splendid cooperation of the customers. Information to the customer had to be clear and concise and so timed that his attention would be increasingly focused on the conversion of his appliances as the actual day of conversion approached.

The program employed in Washington was initiated by the release about the end of April, 1946 to all the newspapers serving the metropolitan area, of a news item stating that 600 Btu mixed gas would be replaced by 1100 Btu natural gas. This was followed by a bill enclosure explaining the change of billing from cubic feet to therm basis. Then, approximately one month before conversion of a large group of districts, a letter was sent to each customer giving information concerning the approaching changeover. About ten days before the start of a large group of districts, a full-page map, identifying each district by number, was published in every newspaper and indication made of proposed weekly schedule of districts to be converted. After the publication of the map, specific instructions in pamphlet form were sent by first class mail, giving detailed information on operation of appliances on conversion day and pending the arrival of the adjuster. These pamphlets were mailed in such sequence that they were received about one week before conversion day. The final notice consisted of a red and black handbill dated for the day of conversion and personally delivered, two days before conversion, by a group of men employed by the conversion contractor. These handbills summarized the information included in the previous pamphlet.

In conclusion, it may be stated that the quick changeover of appliances in each district resulted in the minimum amount of annoyance and inconvenience to the customers, which fact contributed in some measure to their cooperation. The program, as here outlined, for the complete conversion of all appliances served by the Company and its subsidiaries, worked smoothly and efficiently to the end that all conversion was completed ahead of schedule and without a single major accident.

Presented at the Joint Production and Chemical Committee Conference, American Gas Association, Asbury Park, N. J., May 24-26, 1948.

Koppers Consolidates Sales Offices in New York, Chicago

Koppers Company, Inc., have announced that its divisional sales offices in the New York area are to be consolidated in the Empire State Building, New York, and that sales offices in the Chicago area are being consolidated in the Peoples Gas, Light & Coke Building, Chicago.

In New York, Koppers will occupy the 59th floor of the Empire State Building. Sales offices of the Chemical, Engineering & Construction, Piston Ring, Shops, Tar Products, and Wood Preserving Divisions will be located there. These divisions of Koppers formerly occupied space at three different New York locations and at Kearny and Westfield, N. J.

In Chicago, the consolidated offices on the 20th floor of the Peoples Gas, Light & Coke Building will house Chicago district sales offices of Koppers' Wood Preserving, Chemical, Piston Ring, Shops, and Tar Products Divisions. Offices of these divisions previously were in five different Chicago locations.

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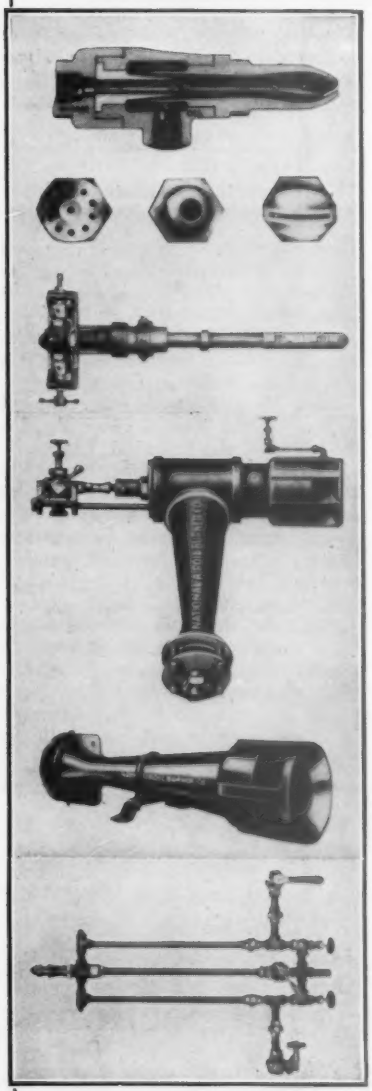

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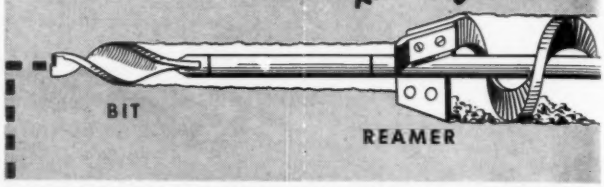

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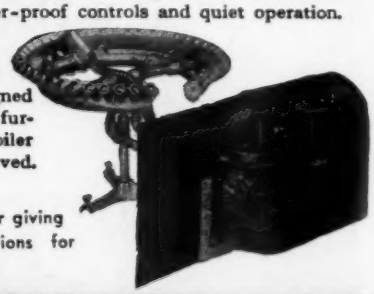

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Recent Court Decisions
Affecting Gas Utilities

Franchise vs Public Service Commission

By
Leo T. Parker
Attorney at Law
Cincinnati, Ohio

RECENTLY, a reader wrote a letter containing a question interesting to all readers, as follows: "What is the line of distinction between a gas franchise, a contract and regulations issued by a Public Service Commission? We have a case where the Commission wants to increase gas rates notwithstanding the franchise clearly stipulates the rates to be charged consumers in this city. Please cite a few decisions which give tips on these points of law."

First, it is well to realize that a Public Service Commission derives its power exclusively from state laws. Also, this authority authorized by state laws is absolute and the courts cannot vary or change the authority or power granted by such laws.

Obviously, circumstances may exist under which a court may grant an injunction against orders, rulings, and regulations prescribed by a Public Service Commission, but a court cannot establish gas rates, nor interfere with the *legal* functions of the Commission, authorized by state laws. See Hayward v. State Commission, 101 Pac. (2d) 1041. Also, see Canadian Gas Company v. Commission, 110 Fed. (2d) 350. The testimony in this case showed that a Public Service Commission issued to a gas corporation a general order for filing schedules of gas rates. Also, the Commission ordered a complete investigation to determine whether the present rates are unjust, unreasonable or unduly discriminatory. The power to do these things was granted by state laws.

The gas corporation asked the court to grant an injunction prohibiting the Commission from making the investigation, but the higher court refused to grant the injunction.

This decision merely illustrates that a court will not interfere with a Public Service Commission doing what it is authorized to do by valid state laws. And in order that a state law is valid the Legislature which enacted the law must have had expressed implied authority by the State Constitution. And under no circumstances may the State Legislature enact valid laws in violation to the provisions of the State Constitution.

For example, in City of Denison v. Municipal Gas Company, 3. S. W. (2d) 794, the higher court decided: First the Legislature cannot abolish constitutional offices, or shorten terms of an office the term of which is fixed by the Constitution, and second, the duration of the term and authority of a Commission shall depend not on legislative will, but on the solid basis of constitutional authority.

Police Power

Under implied authority of *all* stated constitutions a state may, in the exercise of its police power, change franchise or contract rates for the protection of the inalienable rights and general welfare of its citizens. Hence, although a contract exists in which gas rates are established, if such rates are *unreasonable*, or based on fraud, a state may through its police power alter or change such rates, or it may authorize a Public Service Commission to do so. (See Munn v. Illinois, 94 U. S. 113, 24 L. Ed. 77; Milwaukee Company v. Com., 153 Wis. 592, 238 U. S. 174, 59 L. Ed. 1754.)

On the other hand, this statement of the law must not be confused with the opposite relating to city ordinances or contracts which fix *reasonable* gas rates for a limited period of time. (See Southern Company v. Chariton, 255 U. S. 539.) In other words, ordinances and contracts of this nature are valid and, in the absence of fraud in establishing the rates, it is quite impossible for a Public Service Commission to change or alter the rates thus agreed upon.

On the other hand, gas rates established by a legally authorized Public Service Commission where no contract or franchise is involved, are presumed to be valid, reasonable, and just until declared otherwise by a court of competent jurisdiction. In order to overcome this *presumption* the burden of proof that the rates are unreasonable or based on fraud rests heavily upon the complaining party. (See 292 U. S. 290). This means, of course, that a citizen or other interested party who files suit to invalidate gas rates established by a Public Service Commission will not receive a favorable verdict unless he proves conclusively that the rates are illegal or unreasonable.

See State v. Lone Star Gas Company, 86 S. W. (2d) 484, where a duly authorized Public Service Commission, after careful consideration, established reasonable gas rates. The court said:

" . . . Rate making has been delegated to the Commission alone, and its acts in that regard have the force and effect of statutes."

For comparison, see United Gas Public Service Company v. State, 89 S. W. (2d) 1094. The testimony showed that a city granted to a gas corporation a 25-year franchise with authority to construct and operate a gas distribution system in the city. Twenty-three years later the city, acting under the authority of a state law, passed an ordinance and lowered the gas rates. After due consideration the Public service Commission promulgated an order increasing the gas rates considerably over the rates specified in the city ordinance.

The gas company was not satisfied with the rates established by the Commission and immediately filed suit to restrain the city from enforcing the new rates, contending that the rates were "unreasonable." However, since the gas company did *not prove*

that the new rates actually were unreasonable, the higher court upheld the rates established by the Public Utility Commission, saying:

"Rate making is essentially a legislative function. Rates fixed by the Commission have the same force and effect of statutes, and are subject to court review to the extent only as statutes of the same import are so subject, . . . The rate fixed by the Commission is presumed to be valid, reasonable, and just until declared otherwise by a court of competent jurisdiction."

Franchise Expired

Quite obviously where a franchise or other contract specifying gas rates expires the parties are free to make a new agreement, generally, of course, with approval of the Public Service Commission. If the rates agreed on in a contract prove to be too low the gas company has no recourse. But if the Public Service Commission establishes rates unreasonably low the gas company may have protection of a court.

For illustration, in Central Kentucky Natural Gas Company v. City of Lexington, 85 S. W. (2d) 870, an old franchise of a gas company expired, and *no* new franchise satisfactory to the gas company was offered by the city. The gas company gave notice that its gas service would be discontinued. The city obtained an injunction requiring the gas company to continue service pending negotiations for a new franchise. A new franchise finally was agreed on, but it did *not* fix the gas rates. After lengthy hearings, the rates were fixed by the Public Service Commission.

The gas company filed suit to invalidate the Commission's rates on the grounds that the rates were insufficient to net a reasonable return on the company's investment. Before the suit was decided the gas company and city agreed on a new franchise with rates satisfactory to the gas company.

In holding the new franchise ordinance valid the higher court said:

"The city and gas company were as free to agree upon the rates to be charged under the franchise contract . . . The city and the gas company certainly had the power to deal with the situation in a practical way, and so long as the result of their action was to agree upon a return for the gas company that was neither extortionate nor confiscatory, we can see no reason for objection to the method adopted."

Not a Contract

Contrary to the opinion of a majority, a franchise is *not* a true contract. Recently a higher court (106 Pac. 962) stated:

"A franchise is a right or privilege granted by the sovereignty to one or more parties to do some act or acts, which they could not do without this grant from the sovereign power."

Also, in Sapulpa v. Oklahoma Natural Gas Company, 79 Okl. 196, the higher court held:

"A municipality, in granting a franchise to a gas corporation, which permits the use of the streets and alleys for the purpose of furnishing the citizens with gas, acts as a governmental agency of the state."

Hence a gas franchise is a "grant" by a municipality which may be *accepted* by the gas company. In the absence of fraud in procuring the franchise or perpetuality both the city and gas company are fully obligated. Otherwise the franchise may be invalid.

See the leading case of Cedar Rapids v. Cedar, 118 Iowa 234, where the court said:

"Grants of franchises in perpetuity or for unreasonably long periods of time are generally regarded as against public policy, and, if ever valid, the authority therefor must be found in the constitution or statutes of the state."

City Refuses Franchise

According to a recent higher court a city that sells gas may refuse to give a franchise to a gas corporation, and charge a much higher rate than the gas corporation is willing to charge. In other words, a city ordinance specifying the rates which shall be paid by consumers for gas is valid and enforceable, although the same quality of gas may be obtained at lower prices from a gas corporation located outside the city boundaries.

See City of Winfield v. Wakefield, 271 Pac. 392. The facts of this case are that certain citizens requested permission of the city council to lay a pipe line from the city limits in order to convey gas from the pipe lines of a gas corporation which had no franchise to supply gas within the city limits. The city refused this request and the citizens were compelled to use gas supplied by the municipal gas plant at almost three times the rate at which they could have purchased it from the gas company located outside the city.

The higher court held that consumers must pay for the gas at the rates charged by the city, saying:

"There was no discrimination, as the fuel was sold at a price established by an ordinance. The request for the right to lay a pipe line through the streets and alleys of the city to obtain fuel from an outside pipe line company and

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the granting of such a right, was a matter within the discretion and control of the governing body of the city. That body, which has supervisory control of streets and alleys, may have concluded that the welfare of the city would not be promoted by allowing its streets to be torn up and pipes laid in them to enable an outside company to furnish gas to consumers in the city."

Future is Considered

Modern higher courts consistently hold that gas rates established today must be sufficiently high to compensate for anticipated higher operating costs. See Worth Gas Company v. City, 35 Fed. (2d) 743. Here a gas corporation filed suit to enjoin the city from interfering with its putting into effect increased gas rates. The counsel for the company contended that the increased rates should be allowed because the *future conditions* and high cost of operation would not enable the company to continue to earn a reasonable income on its investment.

After carefully considering the testimony the court concluded that although the rate, in consideration of the present conditions, netted a reasonable income, yet the rate was insufficient in view of existing circumstances which would affect the future income of the gas company. This court said:

"A rate depends upon the property value at the time of the effective date of the order and for a reasonable time thereafter. The present and the future must be considered."

On the other hand, no court will write omitted words into a contract or franchise in order to assist a gas corporation to earn a reasonable return on its investment, or prevent a financial loss.

For example, the courts never presume that the word "exclusive" was intended to be included in a franchise held by a gas company. This rule of the law is applicable although the officials of the gas corporation honestly believed the corporation possessed an exclusive franchise, and expended money when relying on this belief. On the other hand, a court may imply a set of facts based on an expressed agreement.

See Laurel v. Mississippi Gas Company, 49 F. (2d) 219. In this case it was shown that a gas company held a franchise to manufacture and distribute "artificial" gas. The gas company manufactured and sold *artificial* gas for many years, and later applied for a permit to distribute and sell natural gas. The city officials refused to grant the permit unless the gas company reduced its rates contending that since the franchise stipulated artificial gas the company could not distribute and sell natural

(Concluded on page 36)

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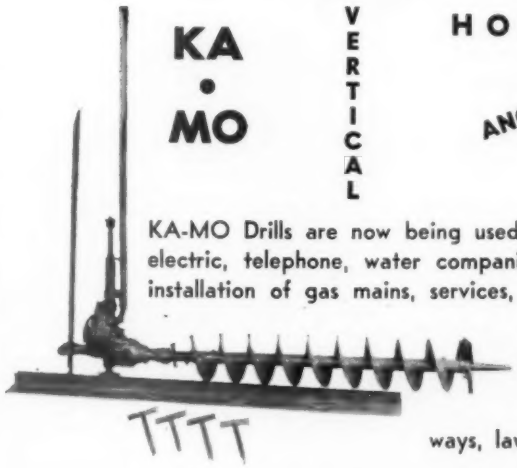

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Along the Pipe Lines

Alabama-Tennessee Natural Gas Co.

The Federal Power Commission has approved with minor modifications the presiding examiner's decision authorizing Alabama-Tennessee Natural Gas Company to construct facilities to serve northern Alabama and Mississippi markets.

Under the decision of the presiding examiner, the company was authorized, subject to Commission review, to construct and operate a 10¾ inch transmission line from a point of take-off from the line of Tennessee Gas Transmission Company near Selmer, Tennessee, to Tuscumbia, Alabama, a distance of about 75 miles. From Tuscumbia a 6⅝ inch line would extend 61 miles to Huntsville, Alabama. Laterals would be constructed to serve other Mississippi and Alabama communities.

Chicago District Pipeline Co.

The Federal Power Commission has authorized Chicago District Pipeline Company of Joliet, Illinois to loop its existing Calumet Line with approximately 41 miles of 24-inch pipe extending from Joliet to the southern city limits of Chicago.

The proposed new line, estimated to cost about $4,000,000, is intended to provide certainty of service to the company's existing customers and to permit storage of gas that can be used in meeting the peak requirements of the present market.

Potomac Gas Co.

Potomac Gas Company, a wholly-owned subsidiary of Washington Gas Light Company, has applied to the Federal Power Commission for authorization to build and operate a 16-inch pipeline, approximately 18 miles long, between a point near Dranesville, Virginia and Arlington, Virginia. The purpose of the project is to augment the supplies of natural gas available to Washington Gas Light Company and its subsidiaries for distribution in the Washington, D. C. metropolitan area.

The East Ohio Fuel Co.

The Federal Power Commission has granted temporary authorization to The Ohio Fuel Gas Company, Columbus, Ohio for the construction and operation of additional natural gas pipeline facilities in Ohio to increase transmission capacity to Toledo, Fremont and adjoining areas. Cost of the project has been estimated at $3,082,000.

The facilities requested in the company's application include approximately 61 miles of 20-inch pipeline between Pavonia Compressor Station in Richland County, Ohio and the City of Toledo. The company stated that the proposed 20-inch line will replace existing pipelines of smaller diameter so as to provide a continuous 20-inch pipeline between the two points.

Southern Calif. Gas Co.

The Federal Power Commission has granted a temporary authorization to Southern California Gas Company and Southern Counties Gas Company of California for construction of an 18-mile pipeline of 30-inch diameter extending from a point near Rivera, California to the vicinity of Pasadena. The proposed line would be connected with the existing 30-inch diameter Texas-to-California line.

In granting the temporary authorization, the Commission pointed out that it was being granted without prejudice to final action on the joint application of the two companies.

East Tennessee Natural Gas Co.

East Tennessee Natural Gas Company of Chattanooga, Tennessee has applied to the Federal Power Commission for authorization to construct and operate additional natural gas pipeline facilities which would increase the delivery capacity of its previously authorized pipeline system by 100,000,000 cubic feet a day. Of this amount, 60,000,000 cubic feet is intended to meet requirements of the Atomic Energy Commission at Oak Ridge and the balance to serve towns and industrial customers in middle and eastern Tennessee.

The proposed facilities consist of approximately 319 miles of 22-inch, 16-inch, 8⅝ inch, and 6⅝ inch pipeline extending from the pipeline system of Tennessee Gas Transmission Company to Bristol, Tennessee.

San Juan Pipe Line Co.

San Juan Pipe Line Company of El Paso, Texas has applied to the Federal Power Commission for authorization to build a 451-mile natural gas pipeline of 26-inch diameter from the San Juan Basin of northwestern New Mexico to a point in Mojave County, Arizona about 20 miles east of Needles, California. Purpose of the project is to supply natural gas for ultimate distribution in the San Francisco Bay Area of northern California.

Texas Gas Transmission Corp.

Texas Gas Transmission Corporation of Owensboro, Kentucky and Memphis, Tennessee has applied to the Federal Power Commission for authorization to construct and operate an 840-mile natural gas pipeline from the Carthage Field of east Texas to a point near Middletown in southwest Ohio.

The proposed new line would link up Texas Gas Transmission's existing Memphis Division lines, running from the Lisbon and Monroe Fields of northern Louisiana to western Tennessee, and its Kentucky Division facilities which run through western Indiana and western Kentucky. At its eastern terminus in Ohio, the new line would connect with facilities of Texas Eastern Transmission Corporation.

Southern Natural Gas Company

The Federal Power Commission has authorized Southern Natural Gas Company to construct facilities which will increase its main line delivery capacity by aproximately 35,000,000 cubic feet daily to a total of 420,000,000 cubic feet. Tte estimated over-all capital cost is $3,531,000, or $3,678,000, if an alternate plan is used.

The new facilities will, in addition, enable the company to utilize more fully additional reserves in the Gwinville Field, increase the delivery capacity of its Meridian branch line and provide service to ten communities which do not at present receive natural gas service. These communities include Trussville, Fultondale, Gordo, Pleasant Grove, Graysville, Glencoe, Jasper, Montevallo and Ashville, Alabama and Tallapoosa, Georgia.

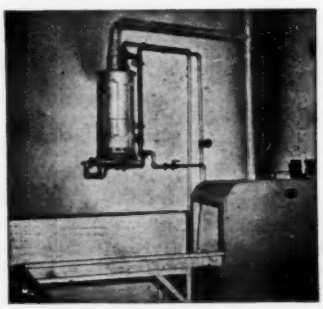
Northern Natural Gas Co.

The Federal Power Commission has authorized Northern Naturall Gas Company, Omaha, Nebraska, to construct and operate natural gas transmission facilities to increase deliverability of its pipeline from 390,000,000 cubic feet daily north of Clifton, Kansas, to 425,000,000 cubic feet daily. The estimated cost of the proposed facilities is $500,300 and will be financed out of general funds.

Kinmont Mfg. Co. Moves to New Quarters in Glendale

Kinmont Manufacturing Company, manufacturers of Kinmont power tool for positioning pipe in welding operations in plant or field have moved to 718 West Wilson Avenue, Glendale, Calif.

AN ACTUAL INSTALLATION OF THE ONLY THERMOSTATIC INSTANTANEOUS GAS WATER HEATER



This installation has been operating for the past several years in the large cafeteria of the High School at Orange, Texas. This No. 3 HOTOMATIC is boosting 140° temperature water from a storage tank up to 180 degrees at a rate of about 4 gallons per minute for a large Hobart Dishwater. Many State Health Departments are requiring 180° sanitary water for Cafes and Cafeterias. Any number of HOTOMATICS can be hooked together to supply large quantities of hot water.

Four models available. All 60° rise,—40, 60, 90 and 150 G.P.H.

AGA approved controls.

Approved by I.G.A. Gas Combustion Engineers

Write For Folders

Little Giant Water Heater Co.

907 7th Street, P. O. Box 1029

ORANGE, TEXAS

New Equipment and Appliances

New "Cleveland" Trailer

The Cleveland Trencher Company of Cleveland, Ohio, have announced their improved Model T-10 equipment and material-hauling trailer.

This is a flat bed, 2 axle front loading model designed for moving overhead shovels, rollers, tractors, cranes, trenchers, bull dozers, back fillers, front end loaders, machinery, pipe, steel, lumber, etc.

Extremely low loading height (under 24") minimizes all bridge and overhead wire problems and enables the user to keep within all federal and a majority of state road laws.

"Cleveland" Trailer Model T-10

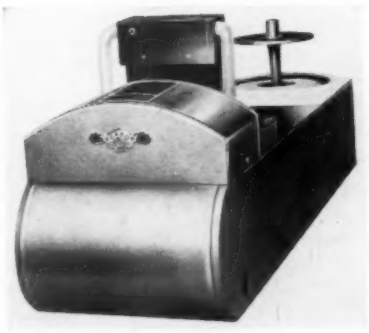
Front loading and unloading is accomplished with a maximum of speed and safety through the unique yet simple design of the trailer front. Two front feet together with the rear wheels of the trailer give a four point support that minimizes the loading angle and reduces materially the hazards of tipping and slipping.

This unit comprises a trailer complete in every detail include as standard equipment: 4-wheel electric brakes, brake control unit for towing vehicle, breakaway switch, loading ramps, tail and side lights, reflectors, safety chains, load binders, eight 8.25 x 20—12 ply tires, full wood bed, and license bracket.

Illustrated folder giving complete specifications and details from The Cleveland Trencher Company, 20100 St. Clair Avenue, Cleveland 17, Ohio.

Gordon Dual Fuel Burner

The Gordon Dual Fuel Burner combines the well known Gordon Spreader Flame principle and its quiet operation in burning gas with a new principle of vaporization and combustion of oil developed by the Midwest Research Institute and the Gas Service Company. This unit is



New Oil and Gas Burner

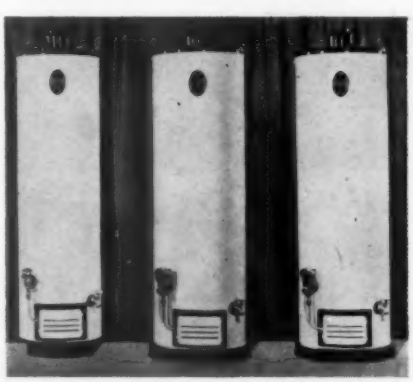
not two distinct burners, but one burner. The oil cycle has been built into and around the Spreader Flame. Parts performing a service on the gas cycle also perform a service on the oil cycle.

In conjunction with the burner unit, an outside thermostat is provided and hooked into the control system in such a manner that gas fuel is normally used. However, when outside temperature goes below a certain predetermined point, this thermostat automatically throws the burner operation over from gas to oil.

This relieves the peak-load problem of the gas utilities and is not a burden to the oil supply system since the entire year's requirements for oil may be provided by filling the oil tank during the summer. The user is protected against any possible low pressure period resulting from a short gas supply.

Bryant Announces Triplets!

Here are Bryant's three new gas-fired, automatic storage water heaters. From left to right, the Model 103 Red Seal, the Model 110 Black Seal, and the Model 115 Blue Seal.



Trio from Tyler, Texas

Two new sound slide-films, featuring the top-quality, rust-protected Blue Seal water heater have recently been released. They take audiences through a modern water heater plant, from steel bay to the final step in the construction of the Blue Seal water heater. Scenes are from the new Bryant plant at Tyler, Texas.

"Whirl-Heat" Conversion Burner

A new "Whirl-Heat" conversion gas burner for use with Natural, Manufactured, Mixed and Liquid Petroleum gases has been announced by Kindl-Aire Corporation, 1480 West 112th Street, Cleveland 2, Ohio.

According to the manufacturer, this unit, certified and listed under the revised 1948 requirements of the American Gas Association, embodies exclusively designed features—including Safety Pilot and Escapement Pilot, 24-port Refractories which achieve a "Whirl-Heat" flame action at grate level on the firepot walls.

New Conversion Burner

Capacity, 135,000 B.T.U. per hour, Burner Head, 24-port refractories of horizontal design; Venturi Tube, cast design; Gas Orifice, Primary Air Injector Type, equipped with interchangeable orifice spuds; Main Gas Control, 1" "Motorized" Gas Valve; Thermostat, T-11 Room Acratherm; Safety Pilot, Escapement Pilot, Gas Pressure Regulator and Transformer. Control Cabinet is of heavy sheet metal, two-tone finish, removable panels and adjustable legs.

Distribution Design

(Continued from page 14)

the 5 miles under consideration and unless the territory being served shows practically no promise of future growth the 5 pound station will be the most desirable installation. Therefore, in answer to the problem first mentioned it would be most practical to replace an obsolete unit with one of the same pressure rather than to attempt to change the entire system because of the apparent increase in capacities of the mains acquired by raising the pressure to a new high figure.

Change in Load Factor

A second problem that the designing engineer would be required to answer would be the consideration of a new class of customer with a poor load factor that can be taken on to fill our present valleys. Eventually this may be the predominant type of customer. Will it be necessary to increase pressures to partially offset the load factor of this new type of customer?

By reviewing the cost indices of the previous study the item which is affected by load factor is the cost of fuel. This item for 5 pounds was shown at $17 and for 10 pounds as $29. If the load factor of the new customer was 30% instead of 40% for the entire system these fuel costs would be 30/40 or 75% of the amount shown, therefore, for 30% load factor the fuel costs will be $13 for 5 pounds and $22 for 10 pounds. By making up a new study of indices at Dollars/M maximum hour for the entire system the following will be the total costs.

What actually occurred was that the annual fuel costs per Mcf max. hour for the 5 pound unit costs were decreased by $4 and 10 pound unit costs were decreased by $7. To again study the figures this differential does not appreciably change the selection of 5 pound over 10 pound units. It does change considerably the cost/M delivered, since a 30% load factor represents an annual delivery equal to 2,630 max. hours and the 40% load factor represents an annual delivery equal to 3,504 max. hours. When the figures for the 30% load factor are divided by 2,630 the cents/M is a much higher figure than the cents/M obtained by dividing the maximum hour cost index by 3,504. As an example the cost/M delivered by a 4" main at 5 pounds would cost 37 cents under a 40% load factor but would cost 49 cents for a 30% load factor. Although the transportation

Plate No. 14

COST INDEX—TOTAL
5 Miles
30% Load Factor
Summary of Station, Fuel and Mains

Size of Mains	*Station Pressures*	
	5 Lbs.	*10 Lbs.*
4"	$1,301	$840
6"	543	368
8"	353	259
12"	227	180
16"	170	145
20"	138	125
24"	107	111

costs have increased, yet the economical pressure at the station has not changed sufficiently to warrant changing the general type of installation.

Summary

This method of setting up data for a transmission pumping design has the advantage of accurately presenting various costs of capital, taxes, compressor stations, mains and any other factors, that the designing engineer may wish to include, in such a manner that the results are reduced to a few columns which show the relative costs of the various units of the study. Changes in load factors are readily computed by adjusting the fuel costs. The cents/M delivered are readily obtained by dividing the index figures by the number of hours/year represented by the load factor which can be broken down into the four major items by simple calculations. The cost/M delivered in partially loaded mains is readily computed by the cost index for the mains. It will also be noted that although the next size larger main may have a capacity possibly 30% higher than the present business now warrants a simple computation will give the actual cost index at its lower capacity. The data is therefore quite flexible and after becoming familiar with the use of the cost indices many questions not mentioned in this study are readily answered by a slight rearrangement of the cost indices.

Presented at the Distribution, Motor Vehicle and Corrosion Conference of American Gas Assn., Pittsburgh, Pa., April 19-21, 1948.

Franchise vs. Public Service

(Continued from page 33)

gas. However, the higher court held that the franchise impliedly authorized the company to sell and distribute any kind of gas.

STAMANCO

A TRADE NAME THAT STANDS FOR

SPECIALIZED EXPERIENCE
LEADERSHIP IN DESIGN
HIGHEST QUALITY WORKMANSHIP
OUTSTANDING SERVICE
DEPENDABLE PERFORMANCE
Let us figure on your requirements.

The STACEY MANUFACTURING Co.
SINCE 1851
CINCINNATI 16, OHIO
GAS HOLDERS • HI-PRESSURE TANKS • PURIFIER BOXES
ENGINEERS • FABRICATORS • CONSTRUCTORS
An Independent Organization Not Affiliated With Any Other Builders of Gas Holders

News of the Gas Industry

Display Committees Meet

Two groups of the Committee on Displays at National Expositions, Frank H. Trembly, Jr., Chairman, met recently at A.G.A. Headquarters to formulate combined exhibit designs and assign space to the cooperating exhibitors in coming national expositions. One was the industrial group who met to arrange the details of the A.G.A. Combined Industrial Gas Exhibit at the National Metal Congress and Exposition to be held in the Commercial Museum, Philadelphia, October 25-29, 1948. An area of nearly 7,000 square feet will be occupied by industrial heating equipment manufacturers to make this one of the largest exhibits ever sponsored by the Industrial and Commercial Gas Section.

The other group met to assign space and make other detailed decisions for the National Hotel Exposition to be held in Grand Central Place, New York City, November 8-12, 1948. Here again on both sides of a main aisle along the north wall in an area of over 4,500 square feet, the leading manufacturers of heavy duty commercial cooking equipment will cooperate in the A.G.A. Combined Commercial Gas Cooking Exhibit.

Both of these national shows will promote the use of gas equipment for the important applications in industry and commercial cooking fields and will afford an excellent opportunity for gas men, manufacturers and customers to meet on common ground. These will be important weeks for all identified with the gas industry.

Commercial Gas Breakfast

The first annual Commercial Gas Breakfast will be sponsored by the Industrial and Commercial Gas Section during the week of the National Hotel Exposition in New York. This idea is in keeping with a companion breakfast that has become a tradition with industrial gas men and has been held during Metal Show Week for the past eleven years.

The breakfast will be given primarily for editors of trade publications in the food service field to give them an opportunity of meeting with commercial gas men and equipment manufacturers. There will be an outstanding guest speaker on a topic of interest to all in this field.

A detailed announcement will be made later as to the day and the hotel in which it will be held. The time will be 8:30 a.m. and it will be over before 10:00 a.m. Here is a chance to start a unique trend in this phase of the gas industry.

N. J. Gas Assn. Annual Meeting

The New Jersey Gas Association will hold a one-day Annual Meeting at the Hotel Monmouth, Spring Lake, N. J., Sept. 10, 1948. An interesting program has been arranged. Amongst the speakers will be:

Harry A. Sutton, President, or Howard H. Melvin, Vice-President, New Jersey Gas Association; Ira L. Craig, Manager of Rate and Standard Practices Department, Philadelphia Electric Co., Philadelphia, Pa.; Roy Alderman, Vice-President, McCann-Erickson, Inc., New York City; William H. Kramer, District Manager, Phillips Petroleum Company, New York City; R. J. Rutherford, Vice-President, Worcester Gas Light Company, Worcester, Mass.

Appalachian Gas Measurement Short Course

The Eighth Annual Appalachian Gas Measurement Short Course will be held at West Virginia University, Morgantown, W. Va., August 30, 31 and Sept. 1st, 1948.

The program committee has given special consideration to the prevailing conditions and has designed the program so as to give emphasis to those phases of metering and regulation which are of greatest interest to the personnel of the industry at the present time.

Equipment displays by the participating manufacturing companies will be located in the University Armory for the duration of the school.

I.N.G.A. Will Hold One Day Meeting

The Independent Natural Gas Association of America will hold a one day meeting October 26th, at the Mayo Hotel, Tulsa, Okla. It will be its fourth annual meeting.

The program will include "Natural Gas Reserves," by N. C. McGowen, president, United Gas Pipe Line Co., "What's New in Steel?" by H. Leigh Whitelaw, managing director, GAMA., "Relationship Between the Distributing Company and the Transporter," by Guy T. Henry, Central Indiana Gas Co., "The Arabian Pipeline," a motion picture on the development of that line, "Questions Posed by the Royalty Owners," by R. C. Kay, Amarillo, Tex., "Ultimate Uses of Natural Gas," (speaker's name will be announced later), and "The Legal Committee Reports on Current Problems," by Marshall Newcomb, Lone Star Gas Co.

Philadelphia Electric Co. Receives P.U.A.A. Awards

Top honors for public relations advertising among the nation's utilities were awarded the Philadelphia Electric Company in a competition sponsored by the Public Utilities Advertising Association, a department of the Advertising Federation of America.

A total of seven prizes were presented to the utility of which three were national awards, three second awards, and a third prize.

Awards were for public relations advertisements, window displays, direct mail literature to residential customers, promotional advertisements, the employee publication, and a series of general advertisements.

CONVENTION CALENDAR

July

12–13 *Michigan Gas Association,* Joint Meeting with Mich. Elec. Lt. Assn., Grand Hotel, Mackinac Island, Mich.

September

10 *New Jersey Gas Association* 33rd Annual Meeting, Hotel Monmouth, Spring Lake, N. J.

13–14 *Midwest Gas Association.* Gas School and Conference, Iowa State College, Ames, Iowa, Hotel Sheldon-Munn.

14–16 *Pacific Coast Gas Assn.,* Annual Convention, Sant Cruz, Calif. Hotel Casa del Rey.

17 *Oklahoma Utilities Association,* Gas Division, Biltmore Hotel, Oklahoma City.

20–22 *National Butane-Propane Assn.* Annual Convention and Trade Exhibit, Congress Hotel, Chicago.

October

4–8 *American Gas Assn.* Annual Convention and GAMA Exhibit, Atlantic City, N. J.

14–15 *Texas Mid-Continent Oil and Gas Assn.,* Annual Meeting, Fort Worth.

21 *New England Gas Assn. Operating* Division. Hotel Sheraton, Worcester, Mass.

25–29 *National Metal Exposition and Congress,* Philadelphia, Pa.

26 *Independent Natural Gas Assn.,* Tulsa, Okla., Mayo Hotel.

November

1–3 *Wisconsin Utilities Association,* Pfister Hotel, Milwaukee.

8–11 *American Petroleum Institute,* Stevens Hotel, Chicago.

8–12 *National Hotel Exposition,* Grand Central Palace, New York.

18–19 *National Personnel Conference* of the Gas Industry, Palmer House, Chicago.

Drake to Address Iron and Steel Engineers on L. P. Gas

"Liquefied Petroleum Gases for the Steel Industry" will be the subject of an address before the convention of the Association of Iron and Steel Engineers, to be held September 28-October 1, in Cleveland, Ohio. The topic will be discussed by Francis E. Drake, chief engineer, Pacific Gas Corporation, New York City, and is scheduled for the convention's September 30th morning session.

A.G.A. Nominations

General and sectional nominating committees of the American Gas Association have announced their selections for officers for the 1948-1949 association year, subject to election at the annual convention in October.

R. W. Hendee, president, Colorado Interstate Gas Co., Colorado Springs, has been nominated for president. Other selections include Vice President Hugh H. Cuthrell, for first vice-president; D. A. Hulcy, president, Lone Star Gas Co., Dallas, for second vice-president; and Edward F. Barrett, president, Long Island Lighting Co., for re-election as treasurer.

Slated for new directors for a two year term are: F. M. Banks, Los Angeles; A. M. Beebee, Rochester; N. B. Bertolette, Hartford; Henry Fink, Detroit; Oliver S. Hagerman, Charleston; John L. Haley, Syracuse; D. P. Hartson, Pittsburgh; George F. Mitchell, Chicago; A. B. Ritzenthaler, Mansfield; Robert W. Otto, St. Louis; John C. Parker, New York; Frank C. Smith, Houston; A. H. Stack, Tampa; Allyn C. Taylor, Reading; and John Van Norden, New York.

Other nominations are as follows: Laboratories' Managing Committee—A. F. Bridge, Los Angeles, chairman, and C. E. Bennett, Pittsburgh, vice-chairman; Accounting Section—L. E. Reynolds, Hartford, chairman, and John H. W. Roper, Washington, D. C., vice-chairman; Industrial and Commercial Gas Section—B. T. Franck, Milwaukee, chairman, and D. W. Reeves, Tulsa, vice-chairman; Manufacturers Section—W. F. McConnor, Pittsburgh, chairman; Publicity and Advertising Committee—R. G. Barnett, Portland, chairman; Residential Gas Section—W. M. Jacobs, Los Angeles, chairman, and H. Preston Morehouse, Newark, vice-chairman; Technical Section—W. R. Fraser, Detroit, chairman, and Ernest G. Campbell, Chicago, vice-chairman.

PAR Committee Reports

The Committee on Promotion, Advertising and Research of the American Gas Association recently issued the 1947-48 Midyear Report to the gas utilities which underwrites the PAR Program.

In a letter addressed to Gas Appliance, Equipment and Accessory Manufacturers, signed by Robert A. Hornby, Vice President, Pacific Lighting Co., San Francisco, Calif., Chairman, PAR Committee, he states in part:

"The continued strength and growth of every branch of the industry depends upon the production of gas appliances and other utilization equipment and accessories that will fully meet the needs and desires of present and potential customers. Only thus can the continued public acceptance of gas appliances and gas service be assured in the future. You will note that the Association's utilization research activities are focussed chiefly upon problems of an industrywide nature which therefore affect and become of value to all manufacturers. The utilization research projects are concentrating on burners and combustion, ignition, venting, heat utilization, appliance corrosion, increased capacities and a general higher level of performance. The cooperation and advice received from appliance and equipment company engineers in furthering the technical progress of this program is greatly appreciated.

"It is of little value for the Committee to carry on this research work and publish the results unless the manufacturers of appliances and equipment make prompt and complete use of this data in the design and construction of their products.

"May I therefore urge your cooperation in making full use of the Bulletins listed in this Report and those to follow? They are available at printing cost."

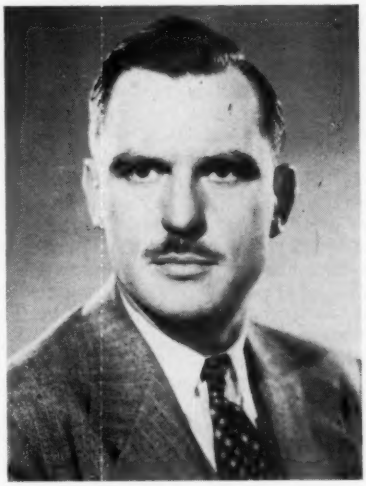
The Report shows evidence of a great deal of thought and care in its preparation. It contains 39 pages and the following subjects are thoroughly covered:

National Advertising, Promotion, Research, Gas Production Research, General Technical Research and Gas Utilization Research, Domestic, Industrial and Commercial.

Zwanzig and Shanley with A.G.A.

Appointment of Otto E. Zwanzig as acting director, Bureau of Statistics, American Gas Association, and of Thomas J. Shanley as secretary, A.G.A. Accounting Section, to succeed Walter E. Caine, who is resigning both positions to become secretary and treasurer of Texas Eastern Transmission Corp., Shreveport, La., has been announced by H. Carl Wolf, A.G.A. managing director.

Appointment for the first time of a full-time secretary for the Accounting Section marks the increasing importance of accounting work in gas industry activities.



O. E. Zwanzig

Mr. Zwanzig is well-qualified to direct the Statistical Bureau's extensive projects. Until recently an instructor in the Department of Public Utilities and Real Estate, New York University School of Commerce, he has broad public utility experience.

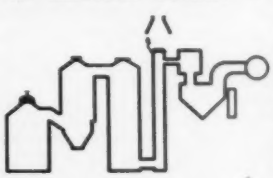
Mr. Shanley joined the Association as a statistical clerk in 1934, then served as assistant statistician until 1943. Upon release from the Army, he rejoined A.G.A. in February 1946 as statistical analyst under Mr. Caine. In June 1947, Mr. Shanley was appointed assistant secretary.

Daniel Parson has been promoted to senior A.G.A. statistician.

Gas Division of Oklahoma Utilities to Meet Sept. 17

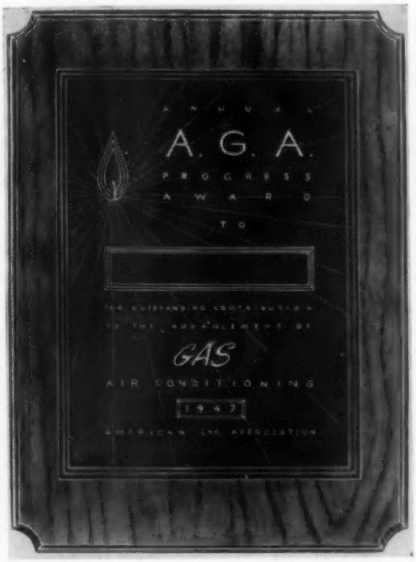
D. W. Reeves, chairman of the Gas Division of the Oklahoma Utilities Association, has announced that the one-day conference of the Gas Division is to be held at the Biltmore Hotel, Oklahoma City, on Friday, September 17. D. E. Frieden is chairman of the program committee for the Gas Division.

SEMET-SOLVAY
ENGINEERING DIVISION
Allied Chemical & Dye Corporation
40 RECTOR STREET • NEW YORK 6, N. Y.



- BLUE GAS PLANTS
- WATER GAS MACHINES
- WASHER COOLERS
- CHARGING MACHINES
- GAS PURIFIERS
- CONDENSERS
- WASTE HEAT BOILERS
- PRODUCER GAS PLANTS

CLEVELAND
"A" TYPE METERS
"B" TYPE METERS
DIAPHRAGMS
Cleveland Gas Meter Co.
ESTABLISHED 1875
2009 Rockwell Ave., Cleveland 14, O. Phone CHerry 2351



BRONZE PLAQUE TO BE PRESENTED WITH AIR CONDITIONING AWARD

The name of the gas utility company which contributes the most to the progress of gas air conditioning will be inserted in the blank space of this bronze plaque at the time of the American Gas Association Convention in October. This plaque and the $1000 award will be presented for the first time on that occasion. The A.G.A. Progress Award is sponsored by the Association with Servel as donor of awards.

San Diego Gas & Electric Awarded Silver Anvil

On May 27, in Washington, D. C., the San Diego Gas & Electric Company was presented a Silver Anvil by the American Public Relations Association for the most effective use of public relations techniques and procedure in its Annual Report of 1947. Hance H. Cleland, chairman of the board, received the award in behalf of the company.

The Silver Anvil is the APRA's top award, one of which is awarded each year for the most outstanding public relations job on Annual Reports, newspaper and magazine advertising, motion pictures, radio, direct mail, employee publications and consumer publications.

The San Diego Gas & Electric Company Annual Report emphasizes the continued postwar growth of its territory served. A special section of the report containing pictorial charts and a comparison of figures for 1940, now, and 1960 is titled "Growth and Development of San Diego City and County, Now and in the Future." Full page pictures throughout the book emphasize the industrial and economic growth of the area served. In a lower corner of each picture page is a portrait picture of a newcomer to San Diego, with a statement of why he came and *why he intends to stay.*

The 1946 Annual Report of the San Diego Gas & Electric Company was awarded a Silver Oscar by "Financial World" as the best report of all utilities. Forrest M. Raymond is superintendent of advertising for the company and both the 1946 and 1947 reports were produced under his supervision.

A.G.A. Sponsoring Restaurant Course

George L. Wenzel, the famous food consultant, has given the American Gas Association an option on his time for the period January 16 to May 14, 1949. During this period he will be booked by gas companies to present his short course in restaurant operation for their commercial customers and his lecture on food purchasing for housewives.

Mr. Wenzel is booked solid for 1948, including engagements for six gas companies: Boston, Hartford, Providence, Philadelphia, Atlantic City and Brooklyn.

Openings for 1949 are as follows: East—January 17 to February 12, 1949. Mid-West—February 14 to March 12, 1949. West—March 14 to April 9, 1949, and South—April 11 to May 14, 1949.

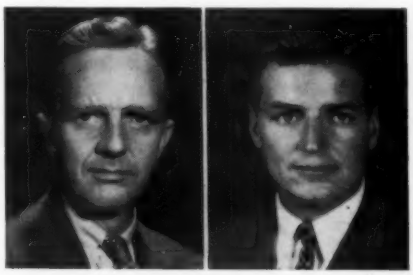
The course consists of three two-hour lectures illustrated with color slides and charts on: a. *Quality of Food.* Buying by specification, recognizing quality, yields of meat and other foods and helpful hints on purchasing. b. *Food Cost Control.* A simple method of controlling food costs, portion control, reducing meat shrinkage, cutting fuel costs by practicing recommended cooking techniques. c. *Pay Roll Control.* How to maintain a specific pay roll cost. Pay roll economies from use of modern equipment, properly maintained. Cutting pay roll costs by time and motion studies. Training personnel.

Milwaukee Granted Rate Increase for Gas

The Milwaukee Gas Light Co. has been granted a rate increase of 6.8 per cent by the commission. The new rates, plus the previous temporary increase of 10%, will give the company a 5% return on its net book value. The commission also authorized the company to base its charges upon the heating value of gas consumed instead of upon the volume of gas consumed.

New Officers Named by Brooklyn Union

Election by the Board of Directors of John E. Heyke, Jr., to vice-president of The Brooklyn Union Gas Company has been announced by the board. Mr. Heyke, who joined the company in 1933, was formerly assistant vice-president in charge of personnel and labor relations.



J. E. Heyke Wm. B. Hewson

The directors also announced the election of William B. Hewson to the position of assistant vice-president. Mr. Hewson came to the company in 1933. He was formerly manager of the publicity and advertising department.

Brooklyn Union Gas Company Announces Promotions

Promotions recently announced by Brooklyn Union Gas Company are John M. Beisty, new General Superintendent of Greenpoint Works; Michael W. Anuskiewicz, Jr., Engineer of Development & Planning; A. Dudley Harrison, now Engineer of Manufacture; and Russell P. Shaffer, who was recently named Assistant to Engineer of Manufacture.

GPM
IRON HYDROXIDE
The mark of
unerring dependability
in purification
GAS PURIFYING MATERIALS CO., INC.
3-15 26th Ave.
Long Island City 2, New York

Vegetation Surveys

NOW is the Season to arrange for inspection of distribution lines to detect leakages.

Our fully trained personnel is at your service. We can submit a complete report covering locations, source of leaks, severity of the condition and vegetation affected. We can cover any section of your lines or the complete system working on a per diem basis.

Write us regarding rates and schedules.

VEGETATION SURVEY ASSOCIATES
53 Park Place, N. Y. 7, N. Y.

Scott Joins Empire Stove Co.

Allison F. H. Scott

Empire Stove Company, Belleville, Ill., has opened a regional sales office at Dallas, Texas. Allison F. H. Scott has been appointed regional director with headquarters at Dallas.

A.G.A. Opens Gas Heating Progress Contest

Individuals who have made outstanding contributions to the advancement of gas house heating will receive a total of $1,000 in cash prizes this year in the second annual contest conducted by the American Gas Association and sponsored by The Coroaire Heater Corporation. Winners of the A.G.A. Gas Heating Progress Award, as it is known, will be announced at the Association's Annual Convention in Atlantic City, N. J., October 4-8, 1948.

Purpose of the award is to give public recognition to those individuals who have done most to create, maintain and increase consumer demand for gas heating. It is open to any executive or employee of any gas utility, holding or service company member of the American Gas Association or any individual members of the Association, with the exception of employees of gas appliance manufacturers.

Five awards will be made as follows: first, $500; Second $250; third $150; fourth $50, and fifth, $50.

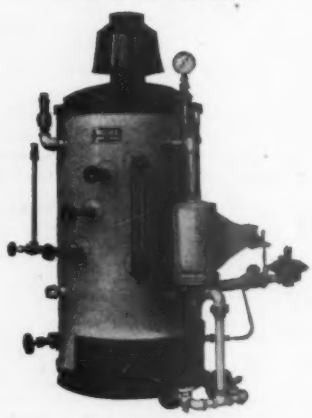
A brochure containing complete details of the contest will be mailed to delegates of all A.G.A. company members and to gas utility sales managers.

Gas Consumers Service In New Quarters, Long Island City

In order to consolidate their sales and service departments and to give better and faster service to their customers, Gas Consumers Service now occupy their own building at 45-10 Court Square, Long Island City, New York, about eight minutes from Grand Central Station by subway. Here they have ample room to stock the more than 1500 repair and replacement parts necessary to maintain the gas burning equipment of their customers in the metropolitan area.

Inspection of the new quarters is invited.

LATTNER
GAS BOILERS
1 H.P. to 45 H.P.



2 H.P. Gas Fired Pressing machine boiler. 100 lbs. ASME Code.

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INDEX TO ADVERTISERS

American Meter Co. 20-21
American Stove Co. ..... —
Autogas Company ..... —
Bryant Heater Co. 6-7
Cast Iron Pipe Research Association, The 4-5
Chaplin-Fulton Mfg. Co. ..... —
Cleveland Gas Meter Co. 38
Cleveland Heater Co. 17
Cleveland Trencher Co. ..... —
Columbia Burner Co. 30
Connolly, Inc. 26
Cruse-Kemper Co. 29
Dearborn Stove Co. ..... —
Dresser Industries ..... —
Empire Stove Company 10
Gas Machinery Co. ..... —
Gas Purifying Materials Co. 39
General Gas Light Co. 43
Hotel Tuller 40
Hydrauger Corporation 30
Ka-Mo Tools, Inc. 33
Lattner Mfg. Co., P. M. 40
Little Giant Water Heater Co. 34
Metric Metal Works 20-21
Mulcare Engineering Co. 39
National Airoil Burner Co. 30
Norton Company 2
Pacific Gas Corporation ..... —
Pittsburgh Equitable Meter Division, Rockwell Manufacturing Co. ..... —
Reynolds Gas Regulator Co. 26
Roberts-Gordon Appliance Corp. 32
Robertshaw-Fulton Controls Co. ..... Front Cover
Roper Corp., Geo. D. ..... —
Safety Gas Main Stopper Co. 42
Semet-Solvay Engineering Division, Allied Chem. & Dye Corporation 38
Servel, Inc. 24-25
Skinner Co., M. B. ..... —
Sprague Meter Co. ..... Back Cover
Stacey Bros. Gas Construction Division of Dresser Industries 3
Stacey Manufacturing Co. 36
Superior Meter Co. ..... —
Syntron Co. ..... —
United Engineers & Constructors, Inc. 41
Vegetation Surveys 39
Vulcan Proofing Co. 8
Whittington Pump & Engineering Co. ..... —

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Combustion Test Set. Bulletin 220, issued by F. W. Dwyer Manufacturing Co., 315 South Western Ave., Chicago 12, Ill., describes this test set which includes CO_2 Indicator, Visi-Draft Gage and pencil type Stack Thermometer. The set is furnished in a metal carrying case and includes rubber tubing, aspirator bulb, flue gas filter, absorbent solution and operating instructions. Bulletin with complete details sent on request.

Centrifugal Blowers. Bulletin 6A-4 just published by The Industrial Division, Bryant Heater Company, 1020 London Road, Cleveland 10, Ohio, covers a complete line of light weight, Hi-Flo centrifugal blowers in 4-18 oz. pressure range, 6,000 to 48,000 c.f.h. capacities.

The bulletin includes photos, diagrams, and capacity and dimensional tables for the complete series, and describes filter combinations for operation in difficult locations.

Water Heaters. Ruud standard type gas water heaters, 20 to 60 gal. capacities, and volume water heaters are described in detail in a four-page bulletin issued by Ruud Manufacturing Company, Pittsburgh 1. Operate with natural, manufactured, or LP gas.

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Research in Synthetic Liquid Fuels

The Gulf Oil Corporation and Koppers Company, Inc., have announced the signing of an agreement under which the two companies will engage in cooperative research and development of processes for the conversion of coal to gas and liquid fuels.

General Brehon Somervell and Sidney A. Swensrud, Presidents of Koppers and Gulf respectively, made the announcement in a joint statement, June 3rd. Work under the cooperative research program already has started.

Both companies have been working for some time independently on matters associated with the production of synthetic liquid fuels, the statement pointed out. Koppers' Research Department, under the direction of Fred Denig, Vice President, has developed and patented several improved processes for commercial production of synthesis gas—the all-important raw material used in making synthetic liquid fuels by the Fischer-Tropsch process. Its Engineering and Construction Division is building for the government a $4,500,000 synthetic liquid fuels demonstration plant at Louisiana, Mo. The plant will use the Fischer-Tropsch process.

The Gulf Research and Development Company, Gulf subsidiary, which is under the direction of Dr. Paul D. Foote, executive Vice president, has long been recognized as having one of the most progressive groups of research engineers in the petroleum industry. Its laboratories at Harmarville, Pa., and several Gulf laboratories in other parts of the country have been working for some time on various phases of synthetic liquid fuel production.

Under the agreement signed by Gulf and Koppers, the cooperative program may lead to establishment of pilot plant facilities to further the joint developments of laboratory research.

Progress Report On Heat Transfer Study To Be Published

Publication of a comprehensive review of research efforts to develop fundamental heat transfer data has been authorized by the Technical Advisory Group for Central Gas Space Heating Research. To be published as an interim report on progress to date, it will cover the work that has been done over the years as well as the current project now in progress at the American Gas Association Testing Laboratories. This represents a most important and outstanding study from the standpoint of long-range fundamental research.

Objective of the study is to seek a broader scientific approach to the design of central gas heating equipment. Little data of a practical nature on application of laws governing heat transfer to heating elements exposed to direct radiation of gas flames are available at present. Engineers may draw on experience, but recognized technical references and handbooks do not exist to show how available fuels and materials of construction may be utilized most efficiently.

It is intended that eventually relationships will be developed between all design variables likely to be encountered in practice. They will be set up to apply to air, water, and oil-backed surfaces, and will also account for all expected variations in burner design, fuel gases used, manner of aeration, shapes and positions of surfaces, and possible types of baffling that may be employed.

During the course of the present investigation special small high velocity thermocouples were constructed, capable of measuring accurately temperature of flue gases and of flames up to the temperature limit of the thermocouple alloys employed. This phase of the investigation has developed instrumentation techniques unusual in their application and of special interest to engineers in the gas appliance field.

To date heat transfer coefficients for both the inside and outside surfaces of an experimental heating element have been computed under conditions of different heat inputs as a variable. The data taken have permitted both theoretical and empirical correlations to be made and heat transfer coefficients to be computed on a point to point basis inside the heat exchanger. Equations for theoretical and empirical relationships developed correlate flue gas, cooling air, and heating element surface temperatures as well as heat transfer rates. These relationships have been applied so far only to the cooling zone, in this instance that portion of the heat exchanger which can see the flame but is not directly adjacent to it.

Locking "Close" Meters With Discs

Savings in cost, time and labor are cited by Southern California Gas Company, Los Angeles, as among the advantages of its practice of locking gas meters with tin discs on "close" orders instead of with the conventionally used solid swivels.

The California utility inaugurated the practice of using tin discs for such purposes in the spring of 1947 and is reported to have found their use quite successful.

George Pickett of the company cited the various advantages of tin discs as being the following:

They are considerably cheaper than solid swivels, costing from $5.00 to $10.00 per thousand for 5 lt., 10 lt., No. 1 Sprague and 5B metric.

They effect a saving of labor in that it takes less time to install or remove them, and fewer round trips to the truck, due to either a wrong solid or open swivel, are required. Less effort is required in locking the meter because it is not necessary to remove the open swivel.

Fewer types of fittings are required, because six different types of discs can be used instead of approximately 15 types of solid swivels formerly used.

Another advantage was cited as being the fact that a serviceman can carry sufficient tin discs in his pocket to service a normal day's work on "locks."

Among disadvantages cited were:

Tin discs are easily removed by the customer or plumber, a factor which has, however, according to Pickett, presented no problem. The company also reported that the small size and inexpensive appearance of the discs may mean more loss of fittings than originally anticipated.

Company servicemen are required to mark the meter number badge with a yellow crayon at the time it is installed in order to identify the presence of a disc installation. This marking, Pickett reported, can easily be removed with soap suds and a rag at the time the disc is removed and the gas turned on.

G. O. MUHLFELD

George O. Muhlfeld, seventy-three, vice-chairman of the board and a director of Stone & Webster, Inc., civil enginers, of 90 Broad Street, New York, died July 8th at his home in Englewood, N. J.

In his forty-seven years with the company Mr. Muhlfeld supervised the construction of many large hydro-electric power dams in the United States and abroad. He was in charge of the design and construction of the Hog Island shipyards, near Philadelphia, which produced merchant ships in World War I.

Mr. Muhlfeld was born in Peru, Ind., and was graduated from Cornell University with an engineering degree in 1897. After post graduate engineering work at Purdue University, he joined Stone & Webster in 1901. He was elected President in 1942.

He was a director of the Stone & Webster Engineering Service Corporation, in addition to being a director and member of the executive committee of the parent company.

W. L. WATTS

Willie L. Watts, assistant gas superintendent of Gulf States Utilities Company in Baton Rouge, Louisiana, died at his home in Baton Rouge, June 23rd. Mr. Watts was 51 years of age, a lifelong resident of this city and had been with Gulf States since May 1, 1922.

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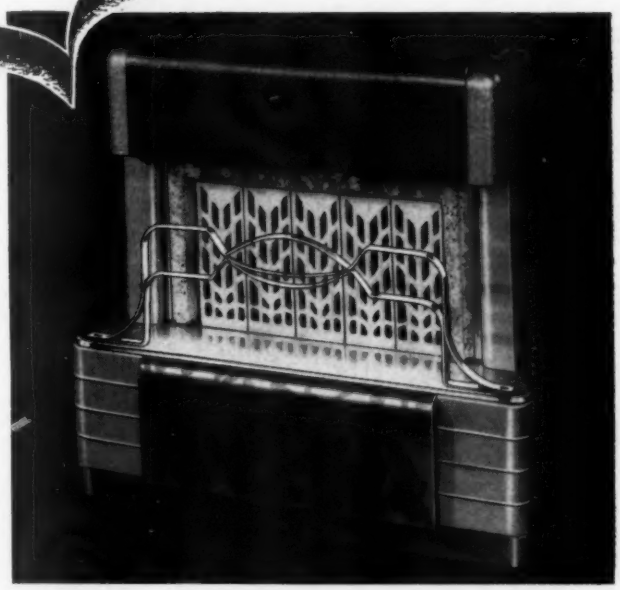

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